NATIONAL COMMISSION ON NEW TECHNOLOGICAL

USES OF COPYRIGHTED WORKS (CONTU)

Transcript of the 18th Meeting

Lamont Library
Harvard University
Cambridge, Massachusetts

16. Abstracts
    Transcript of Commission held in Cambridge, Massachusetts, on November 17-18, 1977. The first day was a round table discussion on the technologies which affect the present and future development of the collection, retention, organization, and delivery of information. Panel members were Dr. Lee Burchinal (National Science Foundation), Moderator; Ms. Barbara Ankeny (M.I.T. Press); Professor William J. Baumol (Princeton and New York Universities); Professors J.C.R. Licklider and Joseph Weizenbaum (M.I.T.); Mr. John Shoch (Xerox Palo Alto Research Center); Mr. Stuart Mathison (TELENET); and Mr. Charles M. Goldstein (National Library of Medicine). The second day Mr. Richard I. Miller, Vice-President of Harbridge House, Inc., summarized a study sponsored by CONTU: Legal Protection of Computer Software; An Industrial Survey.

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Commissioners Present:

    Honorable Stanley H. Fuld, Chairman
    Honorable Melville B. Nimmer, Vice-Chairman
    Honorable William S. Dix, Commissioner
    Honorable John Hersey, Commissioner
    Honorable Rhoda H. Karpatkin, Commissioner
    Honorable Dan Lacy, Commissioner
    Honorable Arthur R. Miller, Commissioner
    Honorable Hershel B. Sarbin, Commissioner
    Honorable Robert Wedgeworth, Commissioner
    Honorable Alice Wilcox, Commissioner
    Edmund Applebaum   for the Library of Congress

Commission Staff Present:

    Arthur J. Levine, Executive Director
    Robert W. Frase, Assistant Executive Director and Economist
    Michael S. Keplinger, Assistant Executive Director and Staff Attorney
    Jeffrey L. Squires, Staff Attorney
    Christopher A. Meyer, Staff Attorney
    David Y. Peyton, Policy Analyst
    Patricia T. Barber, Librarian Analyst

Panel Members, Thursday Session:

    Lee Burchinal, National Science Foundation, Moderator
    Barbara Ankeny, MIT Press
    William J. Baumol, Princeton and New York Universities
    Charles M. Goldstein, National Library of Medicine
    J. C. R. Licklider, Massachusetts Institute of Technology
    Stuart Mathison, TELENET Corporation
    John Shoch, Xerox Palo Alto Research Laboratory
    Joseph Weizenbaum, Massachusetts Institute of Technology

Witness, Friday Session:

    Richard I. Miller, Harbridge House, Inc.

PROCEEDINGS

DR. BURCHINAL: I am pleased to have the opportunity to join with you.
Along with thousands of others, I've been privileged to attend some of your
sessions and follow the difficult areas that your're grappling with.

I believe, at the outset, we should commend Mr. Levine and the CONTU
Staff for bringing together such an outstanding group of people to discuss
with you some of the problems, some of the prospects in the form of informa-
tion processing and communication, arising from the applications of some of
the new technologies. There's probably no logical order in which to call upon
our guests today, but I would like to start and ask Mr. John Shoch to give
our leadoff presentation.

We are going to ask each of the speakers, if they would, to try to
hold their remarks to about twenty minutes, and give us their perspective
on some of the developments and changes they see coming as a result of the
applications of the computer and communications technologies. I suggest we
allow each of our speakers to give his presentation in order, and then, at
the end of that, I would like to try to summarize, if I can, some of the points
of agreement or points of disagreement, where there seems to be convergence
among the remarks. Then we will have the rest of the day for questions
and comments we may wish to put to our participants, and discussion among
ourselves.

So, with that as an introduction, we'll ask Mr. Shoch, who is from the
Xerox Corporation, at the Palo Alto Research Laboratories, if he would give
us the leadoff presentation.

MR. SHOCH: Good morning.

What I'd like to do for the next few minutes is just to give you a very brief introduction to some of the on-going research in the Palo Alto Research Center of the Xerox Corporation, talk a little bit about some of our work with respect to computers, and then show a brief film about some of our current work. Then I'll be happy to answer any questions.

I don't know whether this will really serve as a proper introduction for the entire session, given that I think we're constrained at the moment by the decision to run the film first.

What I'd like to talk about today is a description of our present experience and perhaps some of the future directions of something which has been labeled "personal computing," a phrase that I don't particularly care for, but which has been fairly well accepted, both in professional groups and now in the public's mind. I guess my cue for starting out would have to be an advertisement which some of you may have seen that appeared in the Boston Globe. You have probably monitored the development of microcomputers, smart calculators, and similar machines. There is now a consumer-oriented computer designed to be sold through the Heathkit organization. The adver-tisement ends with the expression "Now it's your chance to find out what the new world of personal computing is all about."

I guess that's sort of what I'd like to try to do very briefly: describe some of the technology, highlight some of the capabilities, and show you a few examples of some of the work that we're doing.

The best place to start is by explaining that much of our work with computers involves a very different model of their capabilities and what

one can do with them, rather than the more traditional sense of using computers

for accounting functions, data manipulation, or information storage and retrieval.

We try to take the broader view of the capabilities of a computer as an infor-

mation processing tool, which, by its very nature, makes it possible to mani-

pulate many different kinds of images, symbols, sounds, and allows you to

replicate many other kinds of media. That is to say, using the capabilities

of a computer, you can model or simulate the behavior of traditional media,

such as paper, television, or traditional recording techniques; but the

machine itself provides the capability to generate new kinds of media and

therefore new kinds of artistic endeavor. Through this power of simulation,

one can pursue real time animation or generation of music in ways that are

in fact different from currently existing capabilities.

Let me cite just a couple of examples. You are all familiar with,

or conditioned to a great extent by, the colors that we see in the world

around us, conditioned by sunlight primarily, and by the printed page. But

it turns out that all the printing processes currently in existence are

fairly restricted as to the domain of colors which they can print. Those

of you in the publishing trade may have seen the illustration used by printers

to describe the colors which they are able to print. But, in fact, using a

television system, controlled by a computer, one can generate colors which

cannot be reproduced either by the photographic process or by the printing

process. One can replicate the full range of colors which one can print

with an offset press, but then generate additional colors which one might not

otherwise see.

Another classic example of the ways in which you can begin to change the content of the media that you use, with the application of computers, is the old cartoon of the can of polkadot paint and the cartoon figure who dips the brush into polkadot paint and sweeps it across the fence painting a row of polkadots. Of course, we all know this can't be done. Yet, in fact, you can do that with a computer. You can design systems which will allow you to work in front of a large screen, painting out polkadot paint or any other pattern that you like.

So what we're looking at, then, are different ways of using computers as personal tools for sorting out one's own information, for aiding in the kinds of things that people do in their day-to-day life on the artistic side, the business side, the educational side.

As I mentioned before, there is a more traditional or older model of a computer which involves large centralized time-sharing machines, shared by many users, primarily for cost-effectiveness reasons. The approach that I'm describing today brings together two different forces. One of those is, of course, the demand for better computer performance. We combine that with increasing capability for providing computer power so that one could provide an animation sequence on a display in front of a user. To do that in real time with very high quality, something approaching what one would see on a Saturday morning cartoon, is beyond the capability of a shared large-scale machine. One must have dedicated local computing power in order to make that feasible.

That, then, is the basic thrust of what we've been doing: providing

individual, stand-alone, personal machines for use by a single person, not
dependent on any of the resources or the activities of other individuals.

When we started out about four years ago, we sat back and tried
to design what such a tool might look like if we were able to construct it.
In functional terms, it would certainly have to be able to handle the
traditional manipulation of text, correspondence, memos, electronic messages,
information storage and retrieval, one's own local private files, communications
to other users, and exchange of documents. As I mentioned, the two real time
tasks, creation of music and animation, are very good test points when one
evaluates a system, because they are particularly demanding. We've generally
observed that if one can in fact pursue those two objectives, many other computer
tests will fall into line.

The mechanical specifications--one would certainly want it to be as
small as possible, portable. In my definition this is the ability to carry the
object and something else under one arm. It should obviously have a flat panel
screen, be completely self-contained, run on batteries so that you can take
it out into the grass with you. We can all sort of outline what that would
look like.

While one works alone with such a machine, you certainly wouldn't
want to work in isolation, and therefore one must have the ability to communi-
cate with similar users and to interconnect with other computer networks, where
appropriate, to access various data bases. These are important resources that
might be too expensive for individuals to have on their own. So one must provide
a communications network intrerface of some variety to an existing facility.

Finally, if one is to customize the system, to fulfill the particular task that an individual has, you must be able to program it in a way that relative neophytes can manage quite well: to allow modification and adaptation of existing simulations, if you will, or existing sub-systems for particular applications.

Unfortunately, such a device doesn't exist—and if it did, I would show it to you today. I'm sure you've all heard about developments in hardware, micro-electronics, memory technologies, and so on. The hardware is coming along. There are thorny problems, and there are people all over the country who are attacking that issue.

There are two other aspects of the problem which are at least as hard, perhaps harder. The second broad area, of course, is the development of software for particular kinds of applications and systems, the ability to program them and modify them in a convenient way. That which takes an increasing fraction of the effort in development of computer systems is now, of course, the programming.

And the final area, the absolute toughest point in our experience in building very large complicated systems is the task of system integration. It's fairly easy to build an individual isolated component. It's fairly easy to build one particular piece of software. It's extremely hard to get all the pieces to work together in such a way that you can take advantage of existing resources on the outside and take advantage of new equipment as it emerges.

The target population that we've been exploring has covered a very

broad range. We've done a lot of work, of course, in office environments with adults in handling of text and electronic mail, messages, document creation, dissemination, selective distribution of information, and automatic access to data bases.

We've also found that in some sense the most challenging audience or target population turns out to be kids. They are generally not corrupted by previous experience with computers. Their expectations haven't been honed down by their frustrations with the computerized credit card system. They are quick to learn. They already have an exposure to electronic games. They are into the tactile field, use of cue boards, in ways that many of us aren't.

They are a very demanding audience, in that we can work for six months and put something together, and we take to to a bunch of kids who are used to Sesame Street, fingerpainting, very good high quality interaction with the things in their environment, and they sort of shrug and they say, "That's not very much." Capturing their imagination has served to be a real challenge.

I think at this point what I'd like to do is to show the film. Let me say that what you're going to see are systems that have been in use now as we've tried to explore the functional capabilities of a personal computer. We don't yet have something as small as a notebook. It has sometimes been labeled the dynabook in some of our documents.

This is the second generation of hardware. We'll probably go into the next phase in a couple of years and that will be the size of briefcase. Advances beyond that will depend on progress both in the technical area and in

dealing with the integration of all the different components in the system.

The film is a little rough in a few places. We didn't edit it out of the way. What you're going to see are systems that have been prepared by us for use by kids in high schools and junior high schools in the Palo Alto area. We'll also see some of the systems which the children themselves have built, and this comes back to the point which I made earlier about the ability to program or to modify existing systems, to customize them to meet particular tasks.

Therefore, you will find that the systems are not as professional as an air traffic control system built by the Defense Department. But you must realize that it is a simulation of an air traffic problem by a 15-year-old high school student and that it was his desire to implement that system, to process the design, and having the tool that made that feasible. That's the kind of work which I look for.

[Film showing]

[The film depicts a series of computer systems being used by several students. The software base was originally developed by members of the Learning Research Group, and those tools were used by some of the students to design and implement their own projects.

The computer being used is a stand-alone, single-user machine which fits underneath a desk. It includes a processor and memory, as well as a high-resolution display and a pointing device known as a "mouse" -- as the mouse moves on the desk top, a "cursor" coordinated with it moves on the screen.

Some of the capabilities exhibited include:

    ---manipulation of text
    ---programming in the language Smalltalk
    ---real time animation
    ---color graphics
    ---a flight simulator
    ---a graphics system for designing electrical circuits
    ---generation of music in real time
    ---production of a printed score, as the keyboard is played
    ---modifying the description of a wave form used to produce the music]

MR. SHOCH: As I said when I began, I just wanted to give you a bit of the flavor for some of the work that we're doing. What more can I say? The systems that you've seen have been in existence for anywhere from three to five years. We've had experience with about 250 children and about 100 adults using this particular system and machine.

I guess the point I was trying to make earlier is that the notion of personal computing as we see it here is just beginning to emerge in the general population. The machines which are available now do not have these kinds of capabilities. These new personal computers are much simpler machines which are not intended for these kinds of applications.

I can't help but think that these kinds of systems will emerge, as time goes on. I guess the only substantive point in the things that you saw was not so much the details of the individual systems but rather the flexibility that the computer has provided us to manipulate otherwise traditional kinds of media, and go in and do things with scores, for example. One can capture a score from the organ, write a program which will go through and syncopate the score and play it back for you in a way which is aesthetically pleasing, but which no person could play with two hands on any piano that we know of.

There are things we can do in animation, color generation, that we just do not know how to do with other kinds of media.

I can answer some questions here. I don't know how you'd like to handle it.

DR. BURCHINAL: Yes. If there is one question, but I would suggest that perhaps we hold others until the other people speak. There will be so

much interaction, overlap amongst speakers...but if you wish to go ahead, all right.

[QUESTION]: I merely wanted to ask if Xerox conducts all the experiments at your office or....

MR. SHOCH: There are several different research centers doing many, many different kinds of work. This particular project was based in Palo Alto. Most of the work is done there. We have run the system with some kids in California, and on occasion we have worked in other parts of the country. But most of the work is done there in Palo Alto.

Let me add a disclaimer to that. In all this, it's a research project and it has no future as anything that will show up in this form in the marketplace, but it's more for our understanding of how to work with those kinds of computers.

DR. BURCHINAL: Thank you, John. I know there will be a number of questions, but I would request us to allow the interaction of the other speakers. Then there may be a richer basis for your questions or comments.

I think it might be good to give the rest of our speakers a little advance notice, so I will suggest an order for the other speakers. In just a minute we'll take Professor Licklider as our next presenter, and then perhaps follow with Professor Weizenbaum, then take individuals in the order in which they appear on the agenda: Professor Baumol, Mr. Mathison, Ms. Ankeny, and close with Mr. Goldstein.

So this will give you some idea of roughly the order in which you're going to appear, and again, I'd like to ask, so that we do have time for

discussion, if our speakers could hold their remarks to perhaps twenty minutes.

I think all of you have known of the work of Professor Licklider for a number of years. He is eminently known for his work at MIT, with ARPANET, the Department of Defense, and a number of other accomplishments. So we're just very delighted, Professor Licklider, that you can be with us this morning.

PROFESSOR LICKLIDER: Thanks very much.

John's introduction was just right, I believe, in being concrete, visible, almost tangible, and it would be more fun, I'm sure, for you if I stayed in that vein. But I think that the other part of the introduction we need is a more abstract one that deals with the dynamics of advance in the computer and computer communication technology that's pertinent to copyright.

So let me speak a little bit as graphically as I can while still being overtly abstract about this. I want to put times down here, running from about 1943 to about the end of the century. I've learned not to try to project into the next one. A word or two about the capability or the cost-effectiveness of the technology would be pertinent to this discussion. I'll just call it cost-effectiveness.   [See graph on p. 12]

If one draws a graph in such a way that there is one unit of capability back with with the Mark IV computer at Harvard University in 1943, and if one pays attention now for a moment just to computer hardware technology and does this in such a way that we go up one, two, four, eight, sixteen, and so on, one finds that there is a steady progress on this kind of scale, in

which the capability or the cost-effectiveness doubles every two years.
I'm sure you have been regaled with that fact many times. It is different
from almost everything else in our experience.

Telephone technology, for instance, goes up like this, doubling
approximately every ten years. This jump is bigger than most of the things,
except atomic energy, which at one time went through a big step, and the possible
speed of transportation which, when rockets and missiles came along, went up.
If one now replots things on a linear scale, where there is none of the
quantity here

UNITS OF
COMPUTING
POWER

1943   1977   2000
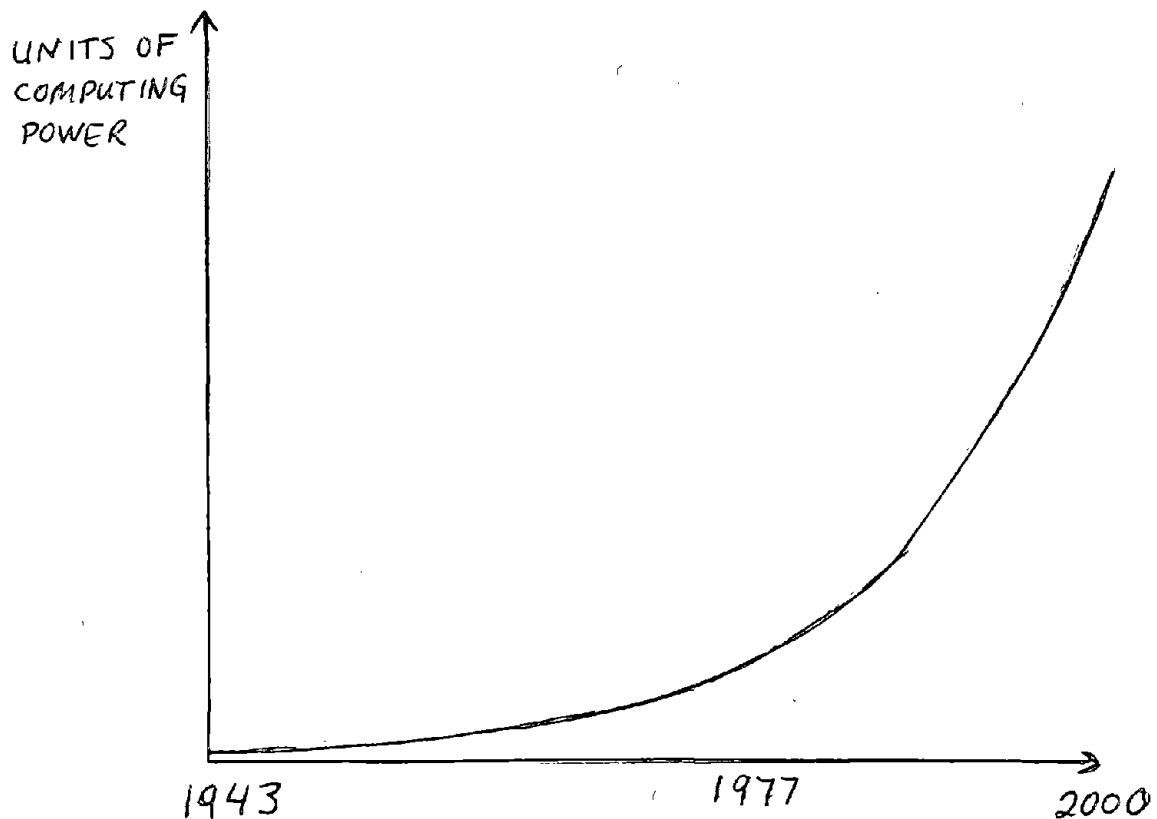
one doesn't notice that anything is happening. But if the trend

continues, as many people in the technology are almost sure it will, on to

the end of the century, fantastic capabilities are on the horizon.

If we redrew that graph just up to here, we would get

UNITS OF
COMPUTING
POWER

1943   1977
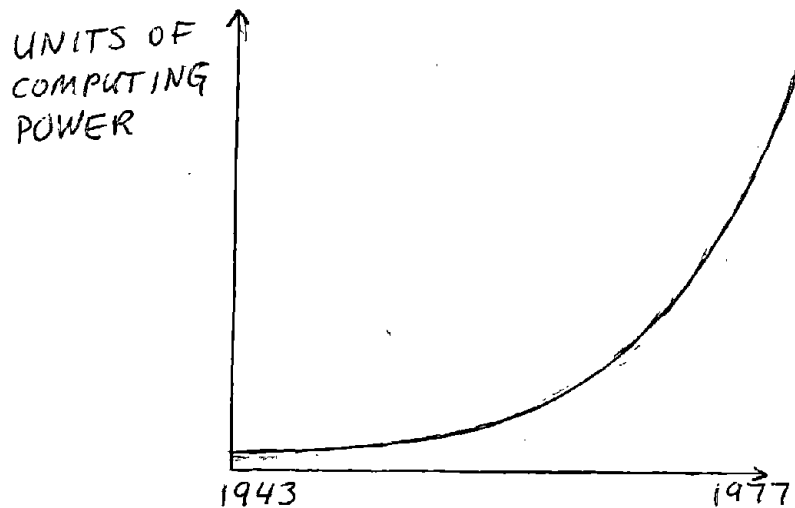
And we would see that at the present time we are just coming into a capability

of doing significant things in some areas. But we have to look at the broader

scale and see that it will the in the 1990's or something before we have

really significant capability as measured by other requirements.

Now, I want to emphasize that this strong dynamic characterizes the

hardware field. The software field, which is another one of the three

essentials, does not move as dramatically as that, but it is moving pretty

rapidly before coming to understand how to make large systems fairly

effectively. The big suppliers, such as IBM, now think they can bring big

software systems in approximately on schedule and for approximately the estimated

cost, which is a very different thing from what it was ten years ago when

everything slipped and overran and was a mess.

The third part of this dynamic is in the incorporation of the technology into application. There it always turns out that it is necessary to make many changes in the attitudes of people and in the skills of people in the nature of the organization into which the technology moves, and that runs very much more slowly. That is really, I believe, responsible for the fact that most people do not see the abrupt rise of the curve.

The inertia associated with this requirement for seriously changing application areas, changing the organization and the people, is all a little bit like the inertia of investment in plant. I heard Amdahl of Amdahl Computer Corporation saying that there is now an investment of about $200 billion in the procedures that go along with the kind of computing that characterizes IBM System 360, 370, for that general style of working. That investment in plant is now bigger than the investment in the telephone plant, which measures at about $120 billion.

So, whereas you have come to expect to see the computer field move very dynamically, as compared with other industries, it may be that a new thing has happened here in this third aspect of the dynamics that has been somewhat sluggish.

Now, one of the things that I believe is very fundamental to the way developments go in the future, is whether the general situation, the legal situation, the administrative situation, is such that new companies or new groups exploiting new technologies can get in and operate without any heavy hand of the past holding them down.

Newspapers, for instance--the ones that have most successfully used

computer technology are the new ones that didn't have a lot of employees
attuned to the old way, that didn't set type, that didn't exist until the new
technology came along.

In short, you can't take a technology in which a small amount of
effort creates a large amount of product and bring this into an organi-
zation in which this amount of effort creates an equal amount of product.
What you have then is this total of the two amounts [about 150%] of effort
creating a double amount [200%] of product, and you have improved things
by perhaps 50 per cent.

However, if a new company comes along and says, "Well, we're going
to use this technology to do this," it has a fantastic advantage. So how
things go is going to depend very strongly upon whether the new technology
is just brought into the existing way of doing things, i.e. IBM, the
telephone company scheme, or whther there are essentially new departures
which are in themselves sufficient.

So I want to get at what this means in relation to particular parts
of this technology we're talking about.

Let's take the transfer of information first. There you have
distribution over long distances and you have local distribution. The
satellite is going to be a fantastic influence on transmission over long
distances, making the real cost to deliver bits very low, to deliver them
3,000 miles or 200 miles.

But there has to be a way to get them to the specific destination
at the other end. Fiber optics promised to make both long distance and local
distribution very inexpensive, but there seems to be no way to bring fiber

optics into anything except the telephone plant.

So it seems to be very crucial whether somebody can think of a way to exploit satellite-like communications without needing local distribution.

Of course, a brilliant idea that will occur to the satellite business corporations is to deal with organizations tht have big plants, that can put large antennas on their roofs, and forget about the rest of the world.

I don't mean to say anything invidious about any corporation, but it's just an obvious thought that now we can have really cheap communication and we can blast into the new world without being held up.

Another approach that may not be paid enough attention would be to use dirigibles or dirigibles with a little helicopter action at, say, 70,000 feet--perhaps a network of those, with one around Boston and one in New, York and one at Philadelphia, Baltimore, Washington, and so forth across the the United States. This would be a network, one communicating with another and with the ground. Now a two-foot dish antenna does what a 40 or 80-foot dish did with the satellite. Everybody, every small businessman, everybody in his home can have the the two-foot dish. That scenario says, Gee, suddenly we have distribution to the home, to anybody.

Well, I'm not sure that would work. That's a thought that is being studied by some advisors to NASA, and some people are excited about it.

But how and whether we really go into a vast new world of information transfer, I believe, will depend on some things like that, because of this dynamic of putting the little bump onto the big one and getting only a modest improvement over-all.

Now, let's take processing. Here we're really on the curve I talked about, and as John Schoch showed, we're coming into personal computers that have a price tag of about a thousand dollars. I heard Maurice Wilkes of the University of Manchester, who happened to design and build the EDSAC computer back in the early fifties. It cost several million pounds--quite a few million dollars.

I went to the Commonwealth Pier Hobby Computer Show, and put together in my mind, out of parts available there, an EDSAC, and the bill was less than $2,000. That's just in case you don't believe we really are riding that curve.

Processors are going to be able to do all of the things we can figure out how to do intellectually with information, and they're going to make possible a much more dynamic information world of sorts, as John was showing you, where a document is a thing that moves and behaves.

About memory and storage capability: this just happens to be the tenth anniversary, within a week or two, of the delivery of the trillion bit store to the Livermore Laboratory in California. And a trillion bits, ten to the twelfth bits, is about one-thousandth of the total corpus of knowledge in the world. If you count just one copy of every document, there are about ten to the fifteenth bits.

The technology, therefore, is ten years old. It hasn't developed as it would have if there had really been a press to use it, because there aren't that many people with--the thing costs only a million or two dollars

so that it's the cheapest form of storage you can get, and it's small.
The trillion bits is in four foot lockers. One person can pick up a quarter
of a trillion bits. And that's old technology.

There is new technology coming along that, based on electron beam
writing on semiconductor chips for one thing, that promises to store
information in such a way that possibly you could get the whole of science
and technology, one copy of everything, in one computer store. And of course,
it would be cheap enough that you could replicate it around the country
or around the world, many times over, if it were better to replicate it than
to transmit it, as it probably would be.

So, the way that explanation was going works in transfer, in processing,
in storage. Where it hasn't worked yet is in the interaction of people
with information, display and control as with keyboards and mice. There hasn't
been that revolution. Mr. Schoch was showing you cathode ray tube display.
Before World War I, the main information display, outside of paper and print,
was the cathode ray tube. We're looking for a breakthrough, but we're not
predicting a breakthrough that will give you very high resolution display in
color, updatable. That is, you don't have to rewrite it all, you just
rewrite the new parts on sheets, so the desk top will be a big information
exchange media. I think you can point to it and it will read your pointing.
I think before the end of the century we'll be there, but we're not yet.

Now, in my last three minutes, I believe the technology will support a
truly revolutionary movement into new ways of working with information.
I believe that software won't hold us back all that much. I suspect that

legislative picture, the picture of people's attitudes, whether they come

to dislike computers because of bad experiences, or whether they come to

embrace them, I think those will be the controlling things.

But we can probably move to a situation where computers can talk

pretty well and understand a little bit if they know the immediate area of

discourse. They can deal with graphs and diagrams easily and with pictures

to some extent.

They will be able to protect the information we put in them, if

they are designed according to the best knowledge of designers and if the

security precautions are implemented well, insofar as trusting people is

concerned. It will be possible to encode the information in them, so that

it will be extremely difficult to decode. It will take thousands of hours of

computer processing to break the code. It's quite well enough for national

security purposes and so it's perfectly well enough for protecting the rights of

authorship, copyrights and so on.

I worry that we may not be giving the computer enough credit for

independent action, for initiative. When a person goes to a library and reads

something, he sizes it up and decides, Yes, I'd like to have a copy of that; I

will pay the copyright fee.

When a computer goes to the library, according to what I have seen,

it may be that it has to pay the copyright fee before it can read the thing to find

out that yes, it would like it.

Now that may not be very significant on the one-shot thing, but think

of the people who will organize the corpus of knowledge, who will bring in

many journal articles into the computer and use the computer to get at the essence of what's going on, and restructure the knowledge. It may be that they will have to pay that input to get that stuff in, and then find out that what they have paid for was of no earthly use. It may be it never gets used.

So it seems to me that one might take the model that, if all this magic I have alluded to is going to happen, and if we really do understand how to make computers do significant things with information, that we ought to adopt the model that the computer is a little bit like a person and can possibly be trusted. In fact, one can design a computer so that it reads something into a little bit of memory and, unless there is subterfuge by the operator, it will not be able to hold onto that when the program finishes running. That memory will be taken away from it and it will not be able to hold it.

So I would thrust upon you this model that maybe the computer ought to be viewed as potentially having, in some small measure, the individuality of a person.

DR. BURCHINAL: Thank you very much.

I know the frustration most people probably feel at this point. But, in fairness to the other people that we have invited here, I'm going to ask you to hold your questions.

PROFESSOR LICKLIDER: I did exactly the twenty minutes.

DR. BURCHINAL: Oh, I know you did it. I wish to commend you.

PROFESSOR LICKLIDER: There was some frustration in doing it.

DR. BURCHINAL: You set a very good example for our speakers.

Turning to a colleague at MIT, Professor Weizenbaum has some distinguished contributions in the computing and in the development and applications field. He is presently a Professor of Computer Science at MIT; he has interests in computer education, as well as in the development of applications in this field.

We're delighted you can be with us.

PROFESSOR WEIZENBAUM: Thank you.

Those are hard acts to follow, both of them.

I might start out by saying the computer field, if it's to be looked at as a science at all, is just a sub-clause in that. One can tell, as a sort of a zero thought or approximation, what fields are sciences and what are not, by asking whether the work "science" is associated with the field or not. For example, physics, mathematics are sciences, where we also speak of political science and computer science, for example.

[Laughter.]

PROFESSOR WEIZENBAUM: But, at any rate, letting that go, computer science is perhaps unique among the sciences, in that computer scientists at least are very often, almost always, talking about what's going to happen. One reason for that is that they get asked by a lot of groups like this, for example, to fall into that role.

Well, obviously our crystal ball is based on the same principle as everybody else's. For example, the idea of exponential cause, and things of that kind.

I tried hard to think about what I might want to say to this group,

worried about copyright and so on, about which I know very little. I think
I have to put myself in a frame of mind where we're talking about the pro-
cessing and dissemination of information and what rights people may have with
respect to it, and what sorts of people we may be talking about.

I noticed both of our previous speakers, at one point or another,
used the word "everybody." One of my colleagues often says tht "nobody is
everybody without me," and it's a good question, who that "everybody" is.
This has a lot to do with the social impact of computers.

For example, some of the kids that we saw in the Xerox film certainly
are exceptional kids. The school population of Palo Alto is an exceptional
population, a very exceptional population. It may be that the kids in Palo
Alto don't know that, but I think it behooves us to know that and to be aware
of it.

In any case, one of the things that is likely to happen with perhaps
some urgency, expecially if the dreams that were presented are to come true
or even very nearly true, is that the term "computer literacy," which is very
much with us in the academic world in any case, will have to take on an
entirely new meaning.

Let me just give a few examples of what it may have to mean to
adults. A few words were used here. For example, it was said that the system
that was being displayed on the screen has a fair amount of knowledge. What
does that mean? I know what it means to the youngsters in my classes at MIT--
well, I can't say I know what it means, but I have a hunch as to what it might
mean. It was said that a 15-year-old built this sytem. What does that mean?

What does it mean to build a system? I very much wonder. I would like very much to hear from some of you what you think that means. I think I've a fairly accurate idea of what it means, but it takes a kind of computer literacy which certainly is not present in the world today, to interpret that phrase in any reasonable sense whatever.

Another word, another term that's very much with us is the phrase "real time." Now, this system does it in real time. What other kind of time is there? Again, that term has a very special meaning in a certain world, and it's a world which, at the moment, most people don't inhabit at all.

If all these things are going to come to pass, then many people who are not now citizens of the world will have to become citizens of it.

Another thing that I think is urgent for you to consider is what all this would mean or will mean when things don't quite work. We might think historically what it meant yesterday, when things did't work; what it means today when things don't work; and what it might mean tomorrow. By yesterday, I mean to say a hundred years ago in the United States.

I essentially want to say that things could be made to work pretty much when they didn't work. If the bridge wasn't sufficiently strong to support the heavy wagons that had to cross it, well, the it was possible for people living in the neighborhood to shore it up and make it work.

When things don't work today--if we take today to mean before World War I, when there was still much more of a tradition of craftsmanship, say, with respect to watch repariing, than there is today, again things could be made to work, but it was harder.

When the computer systems that are being talked about now, and the communication systems, and so on, don't work, then it may be an entirely different story. What I'm alluding to here, something we might discuss, has to do not only with computers but with high technology generally; that is, the increasing vulnerability, the increasing fragility of society.

For example, in testimony that was given in the Senate Armed Services Committee, the Department of Defense said it was very worried about the Russian effort to create satellites that can shoot down other satellites. One reason for this worry is that so much of our worldwide military communications today depends on satellites. The decision to make it depend on that, the implementation of that decision is essentially irreversible now.

Perhaps things don't work because someone interferes, but they may not work for many other reasons. People who work in the world of computers have at least a few examples of things that don't always work.

Let me call your attention to a story, in my view hilarious, which appeared in the New York Times Business Section a couple of Sundays ago. It attempted to tell businessmen, I suppose, what programming is like and what it means to business. They gave an example of a computer program--the sort of thing that operates in the real world--in fact, the computer program which does the typesetting for the New York Times. Now, the article itself displayed an error in that program, which was diagnosable, so to speak, by anyone who has expert knowledge about how computer programs work. In particular, what it mishandled were the last lines of the paragraph which appeared near the bottom of the page, or the column, and it mishandled them in a very systematic way. I could essentially just look at it and tell what the bug in the program is.

Now, that's the <u>New York Times</u>. It turns out that, to my knowledge, no one, say in the last thirty years, has found a single error in the sense of a technical error in anything that the <u>New Yorker</u> has produced. It has a remarkable record. I suspect that the moment they introduce computers to do their typesetting or essentially anything else, that record will be spoiled within a few days or weeks.

This is something to think about, especially in the context of, it seems to me, the copyright and the automatic recordkeeping that may be associated with the question of who owes what to whom; I mean particularly in the area of computer security. There are encrypting and decryptiing schemes which are very, very secure. But in general, the general topic is computer fraud, stealing information from computers for whatever reason and all that.

There are systems which are very powerful locks, so to speak; nevertheless, it has to be said that they don't always work.

The next question I want to address is a very deep and important question; all I can do is allude to it. I think one could spend an enormous amount of time thinking about it, and talking about it, and perhaps doing something about it. What it comes down to is the question of the difference between information and knowledge.

Or, to put it another way, what's the difference between what a computer might be telling you as opposed to what a book might be telling you?

Just on the surface it appears that it's simply a question of representation. In one case you might see it on a video screen, in the other

case you see it on the printed page. So, you know, there really isn't any question here.

But what we've seen and I believe this in indeed, to some extent, the wave of the future, is not the computer as merely a reproducing device, but perhaps the computer as a dynamic active device that not only presents information, so to speak, passively, which happens to be stored in it, but presents information that is, almost at the very moment of presentation, being worked on, dynamically worked on.

For example, the work "simulation" was mentioned. That's another instance in which I wonder what comes to people's minds who are citizens of this world when that word is used. But it's happening in schools now that computer simulations are presented to students. Simulations of some real world events are presented, and, in effect, the computer says what would happen if you change this, that, or the other thing. It doesn't matter to me for the moment whether we're talking about the economic simulations or war games or simulations of aircraft landings or whatever.

Now the question arises: What is the computer telling you? As I say, that's different from what the book is telling you. There are enormous differences. Let me attempt to use the most neutral word I can think of in this connection--what is the status of that "information."

Professor Licklider, for example, mentioned the idea of trusting the computer. We are already in the position, where, very often reasons, or at least justifications, are given on the basis of "That's what the computer said; we did what the computer told us to do."

There'a a good question of what the meaning of that is. It's not clear to me that this is precisely one of your concerns with respect to copyright. I should say that it's not precisely your concern, if you look at what you're supposed to think about with the telescope entirely directed at the copyright question. I think it ought to be the concern of everyone who worries about computer processing, the computer presentation of information.

Finally, to nail down essentially what I've been trying to say, I'm going to lean on something else that Professor Licklider said. Again, I think I know what he means by this, but nevertheless I see it as just enormously problematical. Lick, as those of us who are entitled to call ourselves his friends call him, Lick said that we have computer systems that can store ten to the twelfth bits--even more. That was some years ago, actually. And that this represents a certain fraction--I've forgotten whether you said a quarter of the world's knowledge....

PROFESSOR LICKLIDER: One-thousandth.

PROFESSOR WEIZENBAUM: One-thousandth. Okay, that this represents one-thousandth of the knowledge of the world.

This is, in my view, a curious and potentially terribly misleading use of the word "knowledge." It would follow from this that if we were to multiply that number by a thousand, so that we are now talking about ten to the fifteenth bits as opposed to ten to the twelfth, that those ten to the fifteenth bits would represent the total knowledge of the world.

Now, Lick tried to avoid leading you into this confusion--that's to his credit--by saying that that is the information--that's a problematic word,

too; nevertheless, the infomation stored in documents.

I fear for our children when the distinctions among information, knowledge, and wisdom are increasingly blurred over by the information revolution. Wisdom, another word that hasn't been mentioned at all, surely must have something to do with the public and with publishing. It would happen obviously, and it would especially be aided by systems of the kind that we saw initially, which are marvelous and remarkable. I wish I had one--I don't mean to knock the system. A young person, a student working with such a system may not understand or know anything at all about the degrees of freedom and also the very complex system of constraints which are embodied in that system. I will close with that.

DR. BURCHINAL: Thank you. We have a little different perspective, as a result of these two presentations. As you got into the "information, knowledge, wisdom" discussion, I thought maybe you would have started with data to more or less give that a broader continuum.

I'll resist any further comment except for this very brief one: you do raise the spectre of our technology, lacking reasonable quality control or some other device, leading to tthe condition where the effort to separate the wheat from the chaff wouldn't be worth the candle--two put two metaphors cheek by jowl. I'll stop with that.

[Laughter.]

DR. BURCHINAL: Obviously, I've used that before. That's not original. Turning now from the computer and information and communications world,

we will introduce Professor Will Baumol. Will, if you could focus a bit on some of the shorter-term economic issues and developments that you see stemming out of our technologies as they are now operating....Perhaps that's prejudicing your remarks too much.

PROFESSOR BAUMOL: Will, I'll try to respond, although, of course I'm already preprogrammed.

[Laughter.]

PROFESSOR BAUMOL: Well, as a dismal scientist, I wonder a bit what I'm doing on this side of the table, because I hope to take away with me today more than the little bit that I am able to provide.

I will, however, argue that economics does have something to say about the issues that we're dealing with today. I'm going to offer you two applications of economics to the issue of future techniques, and something about what it indicates by way of prediction change, and second, something about what it can do to help us plan for that change.

For the moment, let me duck Lee Burchinal's point, and focus in terms of far-fetched ideas, that is, science fiction predictions about the world in which books have become a rarity, and the way of conveying information is perhaps by means of a personal screen that you have in your home, or in your study, or wherever it may be. Ask whether these science fiction notions are far-fetched, and what economics has to say about them.

I should, of course, point out that I am well aware that only a fool provides forecasts for the future, unless his forecasts are so far in the future that they will not be occurring in his lifetime. Nevertheless, I will come perilously close to some sort of prediction and leave you to draw your own conclusions.

What, if anything, can an economist say about future techniques, since he can claim no expertise about any of the things that were shown to us on the screen, no knowledge about what options are open, et cetera? Part of the answer will follow very closely some of the things that Professor Licklider said.

You see, economics provides not only the inducement but, in fact, determines the options permitted by the nature of financial constraints. I will have, several times, an occasion to use an analogy with the arts, in which, in its context, I think, some of the analysis I describe is originally constructed. In the arts it is often pointed out that while finances alone can never make creativity and quality flourish, lack of finances can effectively prevent them. The same is true in the case of the transfer of information, where there exist already profound trends for the costs of different means of storage and transmission of information. Already these trends provide constraints which circumscribe the future of these available techniques. Let me first, very briefly, give you an indication of what some of these cost trends are.

Professor Licklider, who knows much more about them than I do, has already given us one side of the two pieces of information I need. He has told us how rapidly the productivity of some of these electronic media has grown. I was told of a meeting a few years ago at which some person who was very knowledgeable in the field started off by throwing a group of chips out on the table, which he invited people to take home with them. He said, "Now, what I want to point out to you is that these chips, all of which together cost me only several dollars, represent what several decades ago were several million dollars' worth of capacity."

We have here an illustration of capacity or cost-effectiveness doubling every two years at a compounded rate; that means going up perhaps at some 40 percent a year.

What is the other side of this relationship? That is, here we have the cost behavior of the one type of storage and transmission of information in the electronic modes which undoubtedly constitute the backbone of the techniques of the future.

Contrast them with the costs of publishing or library operation, where we have data indicating the cost of library operation, taken per volume stored or per student served. We correct it for number of books that are handled; we correct it for the rate of inflation. And yet we find that the data indicate that the costs per unit have been rising at a compounded rate of some five percent per year.

Now, five percent a year does not sound like a great deal, but in fact in a very short time anybody who has ever played with the arithmetic of compounding will recognize that the figures are overwhelming.

Let me just digress for a moment to give you my favorite humanistic illustration. When I was once studying the theater during the reigns of Elizabeth and James, we discovered that this was a period which represented the most profound and serious inflation in English history before the Twentieth Century. Between the year of the accession of Henry VIII which is 1509 and 140 years later when Cromwell's government took over, prices rose eightfold. We made a careful calculation -- all of us first guessing what the figure would be, and we were all wrong. It turned out that this represented an annual rate of increase of 1.3 per cent per year.

Now, I mention this merely to bring out dramatically the really overwhelming power of a five percent per year increase, in excess of the rate of inflation, per unit of material handled.

The question, of course, immediately arises of whether the trends I've been describing are purely fortuitous, whether they represent some brief episode in history, or whether they are built into the nature of the choice that is at issue.

In the case of the electronic techniques, I cannot answer that, except to cite the evidence of the forecasts for the remaining decades of the century. But in the case of conventional publication -- and I emphasize the word "conventional" publication and library facilities -- there is a very good reason to believe that these rates of increase will continue for the indefinite future.

I said I was a dismal scientist, and these dismal reports I can claim partial credit for, if "credit" is the right word -- I can complain that this analysis was jointly invented by Bill Bowen, who is now the president

of Princeton University, and myself, and has been applied to educational costs and also to urban costs. I've done most of the work in urban problems, and he on education. In education the principle is known as Bowen's Law; in urban problems, it is known as Baumol's Disease.

The point is that we are dealing in all of these cases with highly labor-intensive activities, that is, so long as one uses conventional techniques, in which there is very little room for improvements in productivity. There may be improvements in quality but not in productivity, and it is productivity that underlies the costs.

Again let me turn to the arts for a dramatic example. In the very nature of the arts, the productivity in the performance of music is the same as it was in the 18th Century, so long as one sticks to conventional techniques. A Haydn quartet scored for a half-hour performance still takes two person-hours to produce, just as it did in the 18th Century; whereas all the evidence is that in the rest of the economy productivity has literally gone up some twentyfold. Remember compounding.

This means that an hour of performance today in real terms costs twenty times as much as it did in the 18th Century, and those trends are going to be with us for the indefinite future.

What this all means is that, in the choice of techniques for information transmission, it is not a matter of merely the carrot which is going to lure us into using the new techniques, nor even the stick. In fact, we already see the budgetary process which, within the foreseeable

future, is going to force what I described at the beginning of my discussion
as "science fiction" to be transformed into science fact. It is not some-
thing in which we can pick and choose. The message is that the nature of
the cost process almost is going to decide the matter for us. But what
it is going to decide is not as constrained as that sounds. What it decides
is that some change must be made. But of course we do have some choices
about the nature of that change, and the way we prepare for the changeover.

Of course, there are various parties who must contribute to that
process of changeover. For example, users must take part so that the
processes will be designed in a way to serve their interests rather than
happening to fit in with the predilections of the engineers or physicists
who designed them. The technical people also will play some role. Here again
let me emphasize that economics will play some role.

Let me illustrate that once more.

One of the things that is affected by technological decisions is the
size of the economic unit which is best adapted to provide those activities.
It is no accident, for example, that farming is produced in smaller units
typically than automobiles, and it is no accident that farms have grown
in size, as compared to what they were fifty years ago, because the
number of units providing a particular goods or service is very much
affected by the techniques. With one set of techniques, it may be economi-
cal and more effective to have a large number of small units, whereas, with
another set of techniques, a higher degree of concentration, a smaller
number of units, may be far more suitable.

The choice of techniques here already begins to cast its shadow. Let me just illustrate. We're working on a set of formal analyses which will help us to deal with these problems, but a brief illustration will make the point. For example, with conventional techniques for library operations, there is a great deal to be said for many small units -- a few large ones, but many small units -- located in close proximity to the users, with each of them carrying a fairly limited inventory, if I may use that word in connection with libraries.

But the new techniques, by their very nature, may change all that and may call for far greater centralization. It may call for the existence of far larger and far fewer units, each of them far better stocked with a greater variety of inventory with which they can serve the customers more effectively and more quickly.

So what I have suggested is that these forecasts and these anlayses are important because the time to prepare for these new techniques is now. As I have said, there is in fact very little choice in whether these changes will occur, but there is a great deal of choice about the form which these changes will, in fact, take.

One of the objectives will be to avoid what has happened in so many changes of technique in the past: that is, an attempt to force the new techniques into a Procrustean bed, in which they are made to be imperfect replications of what can now be done instead of adopting them to do new and more imaginative things.

Thank you very much. I think I also stuck within my time.

DR. BURCHINAL: Incredible This academic training does seem to have some discipline to it. It shows we have very flexible speakers as well. Thank you very much, Will.

I neglected to introduce Dr. Baumol properly, probably because of our association in various ways; but also I noticed he did appear before your Commission just last July, so that you probably are familiar with Dr. Baumol.

PROFESSOR BAUMOL: It shows even the Commission can make mistakes

[Laughter.]

DR. BURCHINAL: The pun, I think, was errors of commission.

[Laughter.]

DR. BURCHINAL: Going back now a bit more to the technologies and particularly to the telecommunications policy issues, we turn to our next speaker, Mr. Stuart Mathison. Mr. Mathison has been employed with some of our large firms and consulting interests in the area of common carriers, telecommunications, particularly IBM, Bolt, Beranick? and Newman, A. D. Little. He is currently Vice President of Corporate Planning for Telenet, one of the FCC-licensed carriers providing nationwide and international packet-switching. This means all digital kinds of communication services.

It's the kind communications service that makes the distributed networking and computer capabilities that Professor Licklider and Professor Weizenbaum talked about possible for all of us to be able to use on a time-sharing basis.

We're delighted you're able to be with us today.

MR. MATHISON: Thank you very much.

What I'd like to do is not make any projections, but, rather, talk about what Telenet is doing today, what cost changes have already occurred, what some of the computer systems that are connected to the Telenet network are currently doing, and suggest possible new developments.

I'm assuming that the majority of the people here are not familiar with packet-switching networks, the ARPA network and Telenet, so I'll briefly describe this type of network.

First of all, Telenet, as a company, is a regulated common carrier providing public data communications services. It operates a network which first came into being two years ago. It currently consists of mini-computers and micro-computers installed in some 80 cities in the U. S. These computers are interconnected by means of communication lines leased from the telephone company. The network uses the technology called packet-switching. Packet-switching is a technique whereby data from a user's computer or terminal is subdivided into short blocks called packets, which are then stored and forwarded very rapidly from computer to computer within the network to the destination. The whole process takes a fraction of a second, so that it appears to the user as if he has a dedicated physical channel from his terminal to the remote computer that he is communicating with, when, in fact, the network has not allocated, dedicated, a physical channel to him. The result of that process is a substantial economy for those data transmission applications where the data tends to be "bursty," such as interactive applications, where a terminal user is interacting with a computer.

Just to quantify the cost change that has in fact already occurred

for this type of application, the terminal user that previously might have

used the dial telephone network to access a remote computer would have paid

and would pay today in the range of $5 to $25 per hour for communications

in order to access a remote computer. The cost to do the same thing through

the Telenet network is in the range of 50 cents to $5 an hour. So, as

a result, the cost of the communications relative to the cost of computing

has gone through approximately an order of magnitude of change.

To translate that into costs on a per-page or per-document basis,

the cost of sending a page of information, a typical page of 300 words,

through the Telenet network is between a half a penny and a penny. So it

would cost on the order of a dollar or two to transfer a book through the

Telenet network at present. This does not take into account nighttime

discounts, volume discounts, and so forth. So that's a very conservative

cost figure.

I should explain that there are other networks like the Telenet

network in the U. S. Another network operated by Tymshare, Inc., called

Tymnet, is somewhat similar to ours.

In Canada there is a network called Datapak operated by the

Trans-Canada Telephone System. There is a network being implemented in

France of this same type; and another in Western Europe called Euronet. Many

Of the other industralized countries are in the process of implementing or

planning to implement similar networks.

These networks are being interconnected to provide an international packet-switch data communication service.

The significance of that is the cost improvement potential which is even larger internationally for overseas transmission than it is for domestic. For example, there is now international packet-switch service available to Western Europe. The cost change for a telephone call or a Telex call overseas for data purposes currently costs in the range of $100 to $250. That's been the option the users have had available, and, as a result, there has been very little international data transmission, very little international access to computers.

DR. BURCHINAL: That is per hour?

MR. MATHISON: Per hour, yes.

That cost has now fallen to $10 to $20 an hour, with this new service that's been introduced.

So it's now practical for a terminal user in Europe to access a data base, many different data bases in the U. S.

Let me provide an overview of the systems that are connected to the Telenet network.

Today there are 170 computer systems, operated by approximately 150 or 160 different organizations, connected to this network. Each month we add approximately another 10 or 12 additional computers. Some of them are large computers, some of them are small mini-computers that a small company of half a dozen people could buy, and provide special-purpose service through.

Approximately 60 percent of these systems are operated by corporations for private applications, in-house order entry, control and so forth. The remaining 40 percent are computer based services offered to the general public: data base services, time-sharing services, text data services, specialized application services, so forth.

The interest and the wide variety of these systems prompted us a year ago to publish a directory, which I'll pass around. It's now a year out of date. It describes the various computer services that are offered by the companies connected to the network. There are now approximately twice as many companies offering services as was the case when this was first prepared. We're preparing another directory.

I'll mention what some of the companies are doing. Some of the companies offer text data services, which are used for preparing documents. The computer equipment they have is coupled with photocomposition equipment, so that you can, from a remote terminal, prepare a document and have it printed and converted into a physical manual or book or whatever.

There are quite a few companies offering various data base services. In general, the data bases consist today of abstracts or bibliographic abstracts. There are a few full-text data base systems. One that I'll mention is not connected to the Telenet network--LEXIS, which is a full-text legal data base.

The cost of storage today is such that it is not yet quite practical to provide full-text retrieval, but the cost of storage is declining so rapidly that it very shortly will be economical in many more cases than is true today.

Just to give you an example of the rate at which storage costs are declining, the mini-computer equipment which Telenet purchased three years ago, and has been purchasing for the past three years, has a given cost per bit of memory. The micro-computer equipment which we're now purchasing costs one-tenth as much per bit for storage, and the semi-conductor people tell us that that trend is expected to continue.

There's one particular service I'd like to mention, not yet in being, but which is under development, that I think highlights some of the potential problems in the copyright area. The company is proposing to introduce some thing that it calls the "electronic newsstand" to offer electronic distribution of newsletters. This is an application where the user is willing to pay more, and therefore it's the type of application which you would expect to be one of the first to be implemented.

The idea is this: the company would make arrangements with publishers of newsletters, particularly daily and weekly newsletters, such as the Wall Street Letter, the Energy Daily, the Aerospace Daily. These are newsletters that subscribers pay five or six hundred dollars a year to receive, and they currently receive them on a regular basis in the mail, a day or two or three after they were prepared. This company is proposing to provide them, through a computer system connected to the Telenet network, so that a subscriber can receive the newsletter on the same day that it's written.

In addition, the writers preparing the newsletters will be dispersed all around the country and will be preparing the newsletters on terminals. The whole printing process will be bypassed.

Initially that service would be offered as an option to people who receive the physical document, but later, the firm hopes that all subscribers would receive the newsletters in this exclusive way. And that concept could be expanded beyond just simply newsletters.

There are a few trends that I would like to mention, not to make any forecasts, but just to point to some statistics there are, addressing the question of how commonplace in the future terminal access to full-text data bases might be. There are today one and a half million computer terminals installed from our own business and this number is growing at a rate of thirty to forty per cent per year.

We have been talking quite actively with terminal manufacturers and computer manufacturers about interconnecting their equipment to our network. As a result we hear about products which are expected to be announced within the next year or so. We understand that there will be home computers and home computer terminals which are quite powerful available at a purchase price of a few hundred dollars. These will not be simply hobby kits, but will be manufactured on a mass production basis by major merchandising organizations with initial applications in the games and entertainment area.

Also, Telenet will be introducing a message communication service shortly. I think that one of the early applications of many of these terminals, both the home and business terminals, will be to introduce a larger set of people to the notion of using a terminal as an interaction

with communication service, very simply.

I'd just like to illustrate by using Telenet as an example, an organization of approximately 100 people with normal distribution of professional and clerical staff. Everybody in the company has a terminal or has access to a terminal, and everybody uses those terminals from the receptionist, secretary, and bookkeepers in the accounting department on down, for sending messages to other people in the organization. Generally most of the people use the terminals directly. They find that typing a memo on a terminal, as opposed to on a typewriter, is not so difficult, so ominous. As a result, a lot of people who otherwise would have been very reluctant to use computers or to do any programming have become more at ease.

We've now upgraded many of the people on the staff. Those who were originally simply typists have now become programmers. There are users who are using application programs that originally we never would have expected to be willing to do so.

Over the past couple of weeks since we were invited to participate in this seminar, I have been thinking of what copyright problems arise out of these changes. The few that came to mind perhaps have already been discussed ad nauseam by this Commission -- like bringing coals to Newcastle. But let me suggest a couple.

One is the issue of sufficient notice in case of a terminal accessing a copyrighted work. Normally copyright notice is placed at the front of the physical document, but when you are accessing the document by a computer, you may very well never look at the first page. You may simply jump in and search for a particular section and therefore never see it.

So what constitutes sufficient notice in the case of computer access to copyrighted material?

The second area is completely speculative. It is the notion of rebroadcasting, analogous to rebroadcasting television signals by cable television systems. A terminal or computer accessing a remote system and receiving copyrighted material could very easily redistribute it. That's not a phenomenon which I've seen occur, but it's a possibility for potential future problems.

And the other area is the fair use doctrine applied to computer terminals. Right now this use primarily applies to libraries making copies of copyrighted materials. It is a reasonably enforcible and controllable situation because there are a limited number of libraries with terminal access. The fixed cost of obtaining the documents is relatively high.

Anybody can have a terminal; the cost is relatively low. Access to copyrighted materials becomes much easier, and the problem of enforcement of fair use becomes much more difficult.

Thank you very much.

DR. BURCHINAL: Thank you.

I again ask for your forbearance, please, while we hear from our last two speakers. Mrs. Barbara Ankeny is here from the MIT Press. Would you care to make any comments?

MRS. ANKENY: Very briefly. I'm not sure I'm at the right meeting.

I know something about the past; I know something about the current written copyright law, but I am not completely sure about the implementation of that law. It's going to be tough for publishers. I like the idea of the law. I like the fact that there's more protection. It's now a single code;

it's not the common law plus the statutes. I think there are many more protections to the authors, as I think there should be.

I worry very much about the kinds of things we've been hearing this morning.

The old copyright law was 1909. The new one is 1978. So what we're saying is we've just finished writing a legal code before all hell breaks loose.

[Laughter.]

MRS. ANKENY: And how is that going to affect it?

I have questions that bother me. Summarizing what my colleagues from MIT and Professor Baumol have said: the heart of the matter -- for publishers, for authors, for everyone -- is going to be the economics of it.

The economics today tell us publishers that we have to use offset, we have to use cold type, we have to look more like the New York Times and less and less like the New Yorker.

Part of that was because the old typesetting unions were so successful in protecting their craftsmen. They, in a way, priced themselves out of the market. So, can it happen to publishers? It could very well be.

Is that going to happen to authors? That also might be. In some ways it has happened.

I worry about how you copyright a software program. I worry about data storage; is that under copyright? Chemical Abstracts, for instance, is that under copyright? Should any of this be under patent law? Should it be under the trade secrecy laws?

Professor Weizenbaum's comment on computer loss worries me, as it indeed worries all of us. If you have any money in the Cambridge Trust, do

you want your employer to know how much money is there? Things like this.
Let alone the federal tax authorities.

I worry about more general things. I'm not a new publisher, I'm an
old publisher. I've seen soundless movies become sound movies. That was
supposed to be the end of books. Television was supposed to be the end of
movies, which was to be the end of books.

I still think that there is a population, probably a minority,
that is comfortable with the physical object of a book. Indeed, the new
copyright law even distinguishes slightly between ideas and the physical
object, whether it's a book, a journal or something.

No one at this table, that I know of, has a scope in his own home.
The first speaker, Mr. Shoch, talked about a portable scope plus equipment
which you could carry. Can you take it to bed? Can you take it on a trip?
Can you take it out on the beach?

I think there is something about the material object of a book that
I am not persuaded is going to disappear quickly.

All right, then, how do you protect economically the existence of
the book? The publisher, the university press, we are in a way like a farm
club: we publish first works of authors, then they go out and make lots of
money and join other organizations. Sometimes we publish collected works of
authors who became old.

How do we protect these authors? How do we keep -- how do we pro-
tect the university? How do we protect the publisher?

These are questions that I find very worrisome. It worries me that
ten to the fifteenth power represents everything printed, whether it's informa-

tion, knowledge -- certainly not wisdom, there can't be that much wisdom.

[Laughter.]

MRS. ANKENY: It worries me very much, how do you translate, implement the fees, the moneys to the people that create the ideas? We saw in the 1970's to the nth degree, until the Nixon Administration cut back on the library acquisitions money, on the research money.

Then a nice depression helped weed out some of this proliferation of information. How much will that increase? Or is it all going to go into the computer? Are we indeed going to have computers in our homes? Are you going to be able to have a printout of Beowulf at five-thirty for three dollars? That worries me very much.

It worries me especially for the young authors who don't have the reputation. How do you pay them? It worries me for small presses. How do you keep the MIT Press in business when it's the only one, as other university presses, that will publish in the "scholarly area"? "Scholarly" usually means non-profitable to almost all publishers.

I worried when I heard the last speaker, Mr. Mathison, talk about the cost of a dollar to get a book through the network. A dollar. Well, okay, ten percent of the dollar is ten cents; is that what the author gets? Does that come under subsidary rights? Do we sell that network right along with translation rights?

The implication of this I find very frightening. I don't completely trust the computer. They can't even handle my simple account at the local department store. I don't trust them, in a network, even though the Bell Labs have seen they're unprotected. I don't trust why they couldn't take one copy

for one dollar, access that book, and pirate it to five million other computers. We've seen it happen in Taiwan, we've seen it happen in Korea. How do you protect the authors?

How do you protect the publisher's investment in this kind of thing? I find that, you know, extremely worrisome.

The questions you raised were extremely important--fair use, the doctrine of fair use. The new law makes that a little broader, a little more simple. It's not only for journals, it also is used very much in scholarly publishings, "to use ideas" often without fees.

These are questions I simply raise because I don't know as much about the technological features. I know what a book should be. I know it isn't a film, and I'm not sure that it is a printout. Whatever it is, how do you protect the creator of it? And the first person that invests in it, meaning the publisher. How do you keep these crafts from disappearing? First, the linotyper. You saw the drawings and so forth; is Picasso's craft dead? Is the publisher dead?

Will you have to see as many typos as the New York Times? Is there work for a good editor? Is there a difference between information, knowledge, wisdom?

I haven't any answers.

DR. BURCHINAL: Well, thank you.

This introduces a note of real concern from someone on the firing line, in juxtaposition to the kind of trends and issues you've been hearing about.

Mr. Goldstein has the unenviable position of being our final presenter this morning. Chuck is Director of Research at the National Library of Medicine, one of our large information networks that is very heavily dependent on the kind

of technologies that you've been hearing about today.

Chuck.

MR. GOLDSTEIN: Thank you.

Let me first, on the credit line, mention that I'm a member of the Lister Hill National Center for Biomedical Communications. This is the R&D arm of the National Library of Medicine.

My staff and I have responsibility for R&D in library and information systems and in computer-based education. We have a very large program -- few people but a large program. I couldn't hope to touch on all the very interesting technological things we're doing, but I really wanted to address just three salient items which relate to the topic at hand.

I want to point out, however, that I feel the very weight of the world essentially on our shoulders, in recognition of the fact that unfortunately -- and I say it in that sense -- that we, among the national libraries, have the only in-house R&D effort in this area.

Among the federal libraries, we are the only in-house R&D effort. And to the best of my knowledge, after 23 years in government, we're the only government in-house effort specializing in this area. I think that's a telling thing with regard to some of the support we're giving these areas.

I feel very qualified to talk about problems of copying, in the sense that when you want to know how to build a better safe you go to a safecracker. Because much of our effort has really been directed towards making it possible to copy and share information, and because there are many aspects of information areas where the sharing is important enough protection.

Just recently I had to give an address at the American Society for Information Science on the aspect of technology implications for networking, national networking, not the National Library network.

I only mention this to show you the germane areas that we are discussing. From our perspective the problem is how to make it easier both to copy and to store and to make the facilities available to the end users.

But the three items that I had wanted to identify were: first of all, the area of on-line access, coming back and summarizing and bringing together the work that Mr. Mathison and Dr. Licklider and others have mentioned. We have addressed that problem from that standpoint, and I want to show the technology, and then I will end with some points of implication for copying.

Network access problems are problems of the ability of data processing machinery to perform certain operations. Obviously, if you couldn't transmit data, we wouldn't have a problem; we wouldn't be addressing the problem. Of course, as Mr. Mathison pointed out, there are significant data transmission capabilities. And obviously, as was brought out by Dr. Baumol, there is the cost. If the cost was very high, once again, that would be an impediment and we wouldn't be too concerned with this area.

We've been actively concerned, in another sense, with sharing. That little black box in the diagram with four things on it are terminals connected to the mini-computer. That's part of our effort to make it feasible to set up such networks easily. There would be a little black box containing a micro-processor, which can be purchased for less than one thousand dollars right now, in single unit quantities. We can, and we are, emulating, making that black box look like a terminal to any network that presently exists.

Now, the purpose of using such a device is so that I can easily take off in machine-readable form any information that the person at the terminal is accessing or looking at. So we've been working very hard to make that easy and make that capability available. I'll come back to that in terms of on-line access to anything that's available on-line—and I hope that if you don't understand what I mean by "on-line" you will say so and I will try to clarify it.

Digital video disc technology: we have a program at the National Library of Medicine to obtain, within 12 months, a data storage capability which relates to a single user environment, similar to that described by Mr. Shoch earlier. We're not quite getting to the point of being able to carry it in your lap. I'm not talking about a computer center data storage capability, but rather about something which you would have next to your local terminal.

The video disc technology is relatively new. I'd be happy to pass a picture of a present video disc system around -- actually it's an industrial model; the consumer model is the machine on the left. The box on the right makes it an industrial model with a little more power. This is a technology which utilizes a 30 centimeter, or 12-inch disc; it looks like a long-playing record.

It will be fabricated like a long-playing record, in that it requires a production process, a master record and then a reproduction of these records. The records we're talking about are used as storage, part optical in nature and using optical technology for reading the surface so that there's no contact.

The video industry has invested several hundred million dollars in the development of this technology. We understand Philips is scheduled to bring out the first commercial consumer model the end of this year, at a cost of $500.

Now, that model, which will provide a playback capability for your color television set will store either 54,000 frames of color, of video, or one-half hour of continuous video entertainment. The big effort, I understand, is with the movies, and they are going to be -- in fact, many movies have already been--recorded and are waiting for release.

From the economic standpoint, we are trying to take advantage of that consumer model which was not intended for use in the computer area. Because of the large market, it is economically attractive to try to take advantage of what is already available. We can provide the electronics within six to twelve months that will allow us to code and decode digital information on what is a consumer video model.

We will have a billion characters per surface, with a maximum of three seconds' response to access any portion of that information, at an esti-mated cost of $1500, a thousand dollars over the consumer model for the electronics. The cost in large scale production is a dollar per disc, when over a thousand are produced.

Now, they are planning to sell movies at something like ten dollars a set, and the movies may have two discs each, so you get some idea of the type of commercial markup.

There is another aspect to the video disc technology that was alluded to as part of the curve that Professor Licklider drew before. We are trying to extend this technology to true computer mass storage, which is a different

level of utilization of this technology than for the video market.

Now we know we can do this in a matter of maybe a year and a half if we fund it, and I'm involved now in making sure it gets funded. That will provide for, at the computer center, a mass storage of ten billion characters per surface -- remember, this is a 30 centimeter disc -- with a millisecond or better response time. So what that means is that six surfaces, six discs, ten surfaces or six discs in that stack as usually used in computers will be the 100 million characters of information, a terabit memory, that Dr. Licklider was referring to before. That's perfectly within our available technology, but we do have to finish the funding for that.

There's a third area that was just addressed. With regard to the advance and impact of technology in publishing, there are many ramifications. Just to epitomize the process -- I've already over-simplified it here -- I did want to point out the typical present process where computers are involved in publishing today.

These are the composition of the text which very often today is computer assisted -- text processing. But then what happens? In general, in computer driven photocomposition, a photo-repro copy of the text is printed out on paper, and then the graphics are pasted in. That is photographed again for the photolith master. This (showing exhibit) is a typical photolith master, which doesn't have any graphics. It's a telephone directory page. After the graphics are pasted in, photolith masters again are made, and then it's printed. Then this is microfilmed because the government and the National Library of Medicine are very concerned with our archival storage problems. The government, in general, microfilms everything multiple times, especially scientific reports. There's NASA and ERDA and DDC and NTIS that do this last process many times over.

The future is obvious. We've already shown it. But the future looks like this, and it has many implications. The composition of the text will be like it is today. However, the graphics will be scanned and digitized. Now, what I have in my hand right here is an example that we did six years ago. The R&D group at Harris Intertype did it. With my help--I was at NASA at the time--we did a photocomposition journal. They scanned and digitized a logo. That's a logo (showing example of the NASA logo in two sizes) that was neither of these sizes; then they photo-reproduced it.

I want to emphasize that we did this six years ago. So this is certainly within the capability of the technology.

The next step would be to merge those two and generate the photo-composition, which we did at that time, with graphics in one fell swoop. And, as an ancillary with the same equipment today, we can also generate the micro-form, not as a derivative of the publication process. We do not have to go through the manual effort of photocopying.

And finally, of course, we print.

The ramifications of these are many. I can't really go into all of them, but I want to point out some of the things that have to do with -- as was addressed before -- the impact on the economic situation. I asked two years ago at the National Computer Conference, where there was a session on computers and publishing, why we didn't have this capability already. I was concerned, on the government's side, by the millions of dollars we spend each year in remicrofilming, and also on the archival problems.

Knowing what the technology could stand, I asked, "Why don't we have it?" The answer was that it simply wasn't economically marketable for

individual publishers.

Of course, I appreciate that from the free market perspective. But knowing that the U.S. Government is the largest publisher in the world, I still don't appreciate it in that respect. The socio-economic issues may even be more impressive in the sense that this is a manual step which is labor-intensive. So that the socio-economic impact of going to the complete composition may really be what the major problem is, in these efforts.

Now, in summary, if I might pass that logo example around you might look at it for detail and capability of the graphic scanning.

Let me just address some of the technology implications regarding copying.

On-line access: we have on-line access to computer based material, and my emphasis at the moment is only on getting a copy in machine-readable form. If you get a copy by taking a picture of the CRT, I think you've already addressed that in the area of photocopying.

I'm really concerned here with the copying in machine-readable form from material that you are given access to in machine-readable form.

As I pointed out; if you're given on-line access to any material, it's really the Betamax syndrome. As far as protecting against copying, you can't. It's uncontrollable, except if you want to go so far as to require a specialized computer terminal.

Suppose, for example, that I want to sell a service to a news digest or to _Time_ Magazine, which wants to set up an electronic version of _Time_, and you want to subscribe to it. If they require you to use a special terminal which they supply, then they can protect it. They can protect it and it can be economical.

The technology today in privacy is that we have these little micro-processor chips, the algorithms and the chips have been defined, that can provide a terminal in which the information coming on-line is enciphered. If that device is in the hardware, cast into resin in your terminal, and there are no plug-ins for printers or anything else, then you can control it. You can display the data, but no one can take it off a in machine-readable form which would be understandable.

With the video disc, obviously the medium is controllable. To generate the master is expensive; it takes a clean room environment. It costs some $500 to $1,000 for the master, and it's just another publication process. I don't know why you would want to put out literature on video disc in digital form. I was thinking of one interesting exception: by using the little microprocessor voice synthesis unit, we would provide the world of literature to the blind directly with nothing more than the digital form of the literature.

However, the medium is controllable, but the content, once again, like on-line access, will not be controllable except if you require a special player. If you're going to disseminate by this medium instead of by publication media, and you require a special video player, which means you've enciphered the material on the video disc and require a special player to decipher it, then you could control it. If the economics or the public would allow that in the future, I can't really foretell.

On the computer base publishing area once again, the medium itself is controllable as far as the publishing process, it's just a variant on that. But the important thing is that the total text that you're concerned with is in machine-readable form.

Now, for the scientific community, which I am closest to, this is important because this means that short of providing on-line access you will have real potential for demand publication of articles. I hope that maybe in that way, especially with our new printing capabilities, our xerographic, computer directed xerographic printing capabilities, you can do demand publication of articles. I am hoping that in the future the primary journals will receive additional moneys from demand publications to support the subscription publication, which is in a downward spiral.

We have something in old journals, in machine-readable form, we could give on-line access to it, but, once again, I have to refer back to the problem of on-line access.

Those are only a few of the things that we are also concerned with: computer-based materials and the ability to access them in networks, download them, distributed processing, or making available some things not quite as John Shoch talked about, of bringing down the cost of delivery systems for computerbased education, for the delivery of any information on the order of hundreds of dollars rather than thousands and tens of thousands.

Thank you.

DR. BURCHINAL: Thank you very much, Chuck.

We've had a wide variety of perspectives presented. Earlier I indicated I would try to make some statement after the people finished.

I think, in light of the time and all of our needs for physical replenishment rather than more verbal assault, or whatever, perhaps we should adjourn for lunch. And then we will resume with the questions.

[Whereupon, the meeting was adjourned for lunch.]

AFTERNOON SESSION

DR. BURCHINAL: All of you were very tolerant and patient this
morning while our various presenters were giving their perspectives on
some of the developments. Now it is your time as members of the Commission
to comment and raise questions. You may wish to direct them to individual
members of the panel this morning.

COMMISSIONER DIX: I have a question for Mr. Shoch. Our special
interest here, of course, among other things is software and the copyrighting
of programs. As you get into this personal computer field what's going to
happen to a program? For example, is a personal computer likely to be sold
with something like a series of cassettes you can slip in to change programs
and these programs all preprepared to do specific kinds of jobs?

MR. SHOCH: That's been the experience up until now. They will
be sold with some repertoire of software.

COMMISSIONER DIX: Now those will be created for that piece of
hardware specifically, right?

COMMISSIONER HERSEY: You did say, though, that the user can create
programs?

MR. SHOCH: Yes. I was going to let you finish before I went on.

COMMISSIONER DIX: No, I was going to say that I'm trying to think
through any copyright implications of anything new that's likely to happen.
It sounds to me as if it's pretty straightforward if the computer programs
are copyrightable. Then this repertoire of programs can be copyrighted.

MR. SHOCH: My answer has been that the advent of large numbers of personal machines does not represent a qualitative change in the copyright problems with respect to software. It certainly increases the total number of manchines in existence; it increases the amount of software, and the number of copies of software that would be distributed. It would increase the potential for abuse if there is some sort of abuse which can potentially take place.

I don't think there are, in that particular area, any qualitative differences in the problem. Certainly all the manufacturers will have all the traditional concerns about protecting their rights to a piece of software.

I think that we'll see an extension of what is already existing now. With the increasing number of machines there will be a great many independent programs going on where someone buys one of the machines, develops his own program for it, and begins to market it independent of the main computer manufacturer. With larger systems it frequently has been handled on an informal or formal basis by the larger manufacturers.

You can write your own program and submit it to the manufacturer. He may include it in his library, and other people can work with it. You may get a one-time fee, then. We have seen the spread of the large number of smaller machines. It's a cottage industry of people writing their own programs. I have no idea what people will do with that.

COMMISSIONER DIX: It does suggest, doesn't it, that perhaps some sort of clearinghouse might grow up for these, as it were, amateur-produced programs.

MR. SHOCH: We already have informal ones where you can exchange programs.

MR. GOLDSTEIN: I would like just to point out that the University of Illinois has a major program in their computer assisted instruction materials, the PLATO System. During a period of many years they have developed over 6,000 hours of teaching material in some 140 areas which they have copyrighted.

Control Data Corporation has entered into an agreement with the University of Illinois to provide access to those materials commercially through their computer. They pay royalty to the University and the authors.

DR. BURCHINAL: Professor Weizenbaum, did you want to....

PROFESSOR WEIZENBAUM: Just another comment on this particular problem you raise. There's an important difference, obviously, between the kind a material that is currently copyrighted, that is, printed material, where a violation consists of copying it when you ought not to, using a Xerox machine or whatever.

Now, with computer programs, the temptation is certainly there. The program comes on a magnetic stick of gum, so to speak, or a little bit of magnetic tape that can easily be duplicated electronically. One thing that discourages that very much is that programs, of course, are intended to make computers behave, and they need to be maintained.

Now, it's very hard to get that idea across to people who know nothing about computers, but the programs need to be maintained. It gains a user very little if the program is at all sizeable, at all complex, simply to have the program as a kind of black box. Even in the academic and scientific community, where programs are very freely shared, generally speaking where the program and

flowcharts are published, people know that they are ill-advised simply to take a program from a particular computer center and copy the tape into their own computer and then intend to use it. It is very, very important to have the program be maintainable. By now there are a fair number of consultants, I think they generally call themselves, who work for small school systems, or not so small school systems, to supply educational material. Their contracts and their livelihood come not so much from the composition of programs which they then sell to their clients, although that, too, but their livelihood derives largely from being on board to maintain the software that they have supplied.

This is an inhibition which does not exist with respect to printed materials, with respect to illicit copying.

DR. BURCHINAL: May I ask you one question there, as one who doesn't know the complete language of the computer specialist. When you said "maintain the tape," what exactly do you mean by that?

PROFESSOR WEIZENBAUM: Yes. I said it is an extremely difficult concept for people to grasp intuitively. It's not a question of maintaining the tape, it's an odd thing—which can be explained, of course, it's not magic—that programs that run perfectly well for a while suddenly—or perhaps not gradually—begin to develop all sorts of disorders and difficulties and then have to be ministered to in order to make them behave even as they behaved a year ago.

One reason for this is that the computer system on which the program was intended to run in the first instance is "improved." Now, the improvement

is a change, really, of the computer system, and that change may induce side effects in the computer system, such that the original program no longer operates as it was intended to operate. Now a modification has to be made to the program as well as to the computer hardware. For example, a very common thing is that a new bulk storage unit was added to the computer system. This new unit would be much faster than the old one which it replaced.

We haven't come to the point, and probably never will, where one can replace these modules, mass storage for example, pull one out, plug the other in, such that it makes no difference at all except that things run faster. There are side effects of making changes just like that.

This is one example of the sorts of things that require parameters. Then, of course, requirements change. Almost anyone who is naive about computers, or even who isn't, and who first uses that sort of thing, will turn to the system designer, that 15 year-old boy, or to the experts and will say, "Gee, if you can do this, can't you also do that?" The user will ask for something just a little bit more, thinking that it must be terribly easy to do. Sometimes it is; sometimes it isn't.

So programs need modification, or, indeed, are often modified in order to improve or enhance the program performance. All this sort of thing goes under the heading of maintenance. It's as if one were to take a novel, and perhaps this will happen, and the reader says, "Well, that's all very nice. You know, I wonder what would happen if the character who unfortunately dies in the fourth chapter were to recover?"

Now, certainly, if the novel is in computer-readable form and the

reader has a computer terminal, the reader is free to modify the novel himself. Unfortunately, he doesn't have the skill that the original novelist has, so he might very well turn to the novelist and say, "You tell we what happened," and so on.

DR. BURCHINAL: We will. Mr. Hersey.

Will you each identify yourselves, please before you ask or answer questions?

COMMISSIONER HERSEY: John Hersey. I wanted to ask Mr. Shoch a question, but first I would like to correct a factual error in Professor Weizenbaum's presentation that I found very moving.

The New Yorker has indeed been remarkable in its record of human care about its spelling and so on, but it has had an error. It took place in the first issue and came about in the following way: --

[Laughter.]

COMMISSIONER HERSEY: The New Yorker bought an article from S. J. Perelman talking about the pliability of New York audiences. Perelman said that any audience now will laugh at the drop of a "ha" on the stage.

[Laughter.]

COMMISSIONER HERSEY: When Mr. Ross saw this line, he wrote in the margin, "If Mr. Perelman feels that this is a joke, he's entitled to this. Please do not change to "hat." And all the way through the process of composition, proofreading, and so on, they were careful to be sure that it was "the drop of a 'ha'."

And, in fact, the night that it was to go to press, Mr. Ross went

himself to the presses and lectured the pressroom men about it. He found it under a roller and was able, from long experience with such things, to read backwards that it was, indeed, "drop of a 'ha'." And he went home, slept soundly, and went to the office the next morning, opened his magazine, and found that it was "drop of a hat." What had happened was that he had given this lecture in the pressroom at 11:30; at 12 o'clock a new shift had come on....

[Laughter.]

COMMISSIONER HERSEY: A bright printer stopped the presses and changed it.

PROFESSOR WEIZENBAUM: I think it reinforces my point, if I may say so.

[Laughter.]

COMMISSIONER HERSEY: And why do you think I'm caught in an error? It is, in fact, along this line that I want to ask this question. It has to do with the outer edge of development of these personalized computers. Is there systematic thinking being done, not just about computer literacy, but about literacy with the use of these marvelously flexible devices? I don't know how many of you noticed that the title of the piece, of the movie by the girl who had the horse running across the screen, was spelled g-a-l-l-o-p-e.

There is a problem in this marvelously flexible device. It seems to me that sensory and spacial and perhaps aural, sound, abilities will be developed and made wider. But human beings deal with each other in words, and I am wondering whether there is thinking being done about this problem, that you

may be widening and narrowing at the same time.

MR. SHOCH: Let me speak to that in several different ways. I don't expect that the advent of computerized tools will, by themselves, solve fundamental educational problems. If one is of the school of thought that believes that there is a decline in literary skills of many students in contemporary schooling, if one believes that, computers will certainly not solve that problem. These tools will not, by themselves, help reverse what some people perceive to be that trend. I tend to think there's a fair amount of support for that.

We have some experience on the ways in which these kinds of tools can help people, help students enjoy the composition of written material by alleviating some of the drudgery. That is to say, we have students who originally came in to learn how to program to do mathematical problem solving and physical simulations of some process, and who learned that the system in addition had very sophisticated textual data handling capability that helped to do away with the very laborious task of typing a manuscript or writing it by hand. We have therefore witnessed an increased tendency to use the system to go back and edit, to make changes and to help facilitate the way in which people write school essays. People who would normally sit down to write from scratch will now go on through the process of editing.

Now, some will argue that that's not particularly beneficial, the fact that you can sit down and knock it off very quickly. It may lead to a sloppier first draft and necessitate the next seven drafts, rather than one using a greater amount of care before sitting down to write something offhand.

We have thought a bit about the way in which one integrates the

schools into the entire subject, how to deal with these problems. My personal view has been that these tasks are much broader than just the technical issues involved. You've got social problems in the educational environment and those problems are much harder than building the tool that provides the help.

I only hope that I've given you a very crisp answer. Everyone pays homage to this problem; very few people can figure out how to define what systematic work to do in studying it further. If you have any ideas, we would certainly welcome them. Thank you.

VICE-CHAIRMAN NIMMER: I found these presentations fascinating, as I'm sure we all did.

What I'm trying to do is focus on the extent to which this brave new world presents new copyright problems, to discover the extent to which they are simply the same copyright problems in somewhat different packages, and really no more difficult than the existing copyright problems.

One question raised had to do, I think, at least by implication, with the copyrightability of works created in part by the machine. That is an interesting question, but one that I don't think is a terribly difficult one. I may be wrong.

Another question raised was, should input, as distinguished from printout, be considered as an act of infringement? That is a problem we've considered and are very concerned with.

But the area that, it seems to me, we should be most concerned with is to what extent these new means of communication make it impossible or very difficult to keep track of what is being communicated, to police, control, license what is being communicated. The fact that it's done through a novel

means does not create a copyright problem unless that novel means is such that the copyright owner is unaware that his work is being reproduced or disseminated. If he is aware of it, then it's no different from the conventional printing press. He may not get a direct signal every time a printing press prints his work and then sells it, but the public dissemination tends to be something that he becomes aware of, and the copyright system works, more or less. There are occasions when the copyright owner is unaware of this, but by and large this has not proved to be a difficult problem.

It is a problem in the photocopying area, where you don't have general public distribution, but each individual makes his own copy and the copyright owner is not aware of it.

I am wondering now, when we go over to the computer area, whether that's comparably true or not. I'm thinking of what Mr. Goldstein had to say about on-line access as being something that is not controllable. I take it this means that the recipient can obtain material from a data bank without the copyright owner of the material in the data bank ever being aware that the recipient has obtained it. If that's the case, then there is a serious copyright problem.

I'd like to explore that a little more, admittedly from complete ignorance on my part. I don't quite understand why it should be technologically impossible to keep track of what is being reproduced on-line. I know you said if there is a special terminal, then it can be done, but not otherwise. Could we have some expansion on this?

PROFESSOR BAUMOL: May I answer this? This is exactly the area that has been bothering me. I'd like to ask, if I may, a science fiction question

to go along with that. You have exactly the same set of problems in the pollution area, where the problem is always to find out who polluted when.

There are ways in which you can deal with that. For example, with ships, you can add chemicals to the oil carried by the tankers, so that if a ship leaves some pollution you can, as it were, have a fingerprint which says that it isn't any old ship, it's not a Liberian freighter that can get away with it.

It there in the future, even though there may be no way at the moment, as I gathered was implied, no way to discover who is using a particular piece of material covered by copyright? Is there in the future some way in which one could add a tracer and analog to the trace elements, which could tell us when someone used the copy for what, and how much?

DR. BURCHINAL: Would you lead off the response, Chuck? And then, Dr. Licklider, I think you referred to this at one point in your remarks. Perhaps you would like to add something.

MR. GOLDSTEIN: I didn't mean to imply that the computer could not control who was accessing the information, at least at the first level; I don't want to get into the details of privacy and computers. But, in general, the computer does know who is actually using the information and can control that, for all practical purposes today, in a commerical establishment.

What I like to refer to as the Betamax syndrome, if you will, in that, given that you have been given access, just as you've been given access by virtue of having a television set, and having broadcast the material, you have access to the video signal. Even though you have access to it, you may be allowed access to that computer; the computer knows that you're having access, but it does not know what you do with it after you have access to it.

You can copy that signal which comes out on your terminal. You can copy it in machine-readable form, just like the Betamax attached to your television set can copy the signal which is being sent to you. It's not that the computer does not know you're receiving it. The computer cannot know, though, that it's being copied in a machine-readable form, unless there is a special terminal required. That's really the question I was addressing.

VICE-CHAIRMAN NIMMER: Well, what are the technological means of the machine knowing precisely what you are making hard or soft copies of?

MR. GOLDSTEIN: It cannot, without a special terminal.

DR. BURCHINAL: No, there's some confusion here, I believe. Today, with our computer accessible systems to remote data bases, what Chuck was saying was that if I were sitting at a terminal addressing a data base, it would record what data base I used, how long I used, and so on. I can be, thereby, billed per use, based on an hourly use of that data base.

All that is very well controlled. There is very clear accounting, with the economic rights distributed to the data base supplier, to the utility, like an SDC or a Lockheed Corporation, or to the carrier that operated-- Telenet, or whatever.

What Chuck was saying after that, however, was once I have gotten into that data base, I could choose to make a machine-readable copy, which I could then peddle independently. Or I could pull that off in paper and copy it or have a third-party distribution of that. There's no way to control that use.

The initial use can be controlled. And all of the economics and all of the rights accounted for, very well today. That is the basis of a very large present business in on-line searching.

VICE-CHAIRMAN NIMMER: Just to clarify this a bit, it's not precisely the same as simply having a television set where you have access to all of the channels, but you don't in fact listen to all of the channels. The analogy would be that it would keep track of the particular programs you were tuning, is that right?

DR. BURCHINAL: Exactly. And what portion of time I had that program on, if effect.

VICE-CHAIRMAN NIMMER: Would it further keep track of which particular material from the data base you are tuning in on?

DR. BURCHINAL: It could. But that becomes an order of additional cost. Normally the systems that are operating today, and I am referring mainly to the interrogation of the scientific and technological bibliographic data bases to make it more precise. Normally the systems would only keep track of the fact that I addressed Chemical Abstracts for 15 minutes, then I turned to Engineering Index for ten minutes, I turned to some other data base for another 15 or 20 minutes. It wouldn't indicate what particular record I drew out of those. All of that could be traced.

COMMISSIONER LACY: It could record the number of lines displayed, too, couldn't it?

DR. BURCHINAL: Oh, sure. It could record right down to which article that I chose to call up.

VICE-CHAIRMAN NIMMER: Well, then, doen't that solve the problem?

COMMISSIONER LACY: No. It's a different problem he's talking about.

VICE-CHAIRMAN NIMMER: Is it that you make a general survey to find out what you're interested in before you go further, or....

MR. GOLDSTEIN: There's the television situation. The problem is that even though you have access to a television program to look at on your set, that program is copyrighted. And even though you're not supposed to make a copy of that, if you put a Betamax on your set, you can make a copy without anyone ever knowing about it.

VICE-CHAIRMAN NIMMER: But, if I understand the analogy, if the Betamax were on a computer you would know what program you're tuning in to. No?

MR. GOLDSTEIN: That only tells you which program you're getting, but not that you're making a copy of it.

VICE-CHAIRMAN NIMMER: Well, but you are getting the program. It would know that you are looking at this particular program in the computer context, with the capability of seeing it, either on the screen or with a hard copy.

MR. GOLDSTEIN: Well, this analogy is more similar to the situation in which you have paid for the journal and you have a right to use it, but you don't have the right to make copies. The publisher cannot control the fact that you make photocopies.

VICE-CHAIRMAN NIMMER: But is that analogous? I don't think it is.

DR. BURCHINAL: I think Professor Licklider has wanted to get in here.

PROFESSOR LICKLIDER: I seems to me you're on one theme, which needs to be carried through to a conclusion. As I see it, it is something akin to piracy by turning into hard copy when the dispenser thinks you are getting only soft copy.

VICE-CHAIRMAN NIMMER: No, but it could be piracy even at soft copy, if you'll pardon me. That could be copyright infringement too, under the right to display.

PROFESSOR LICKLIDER: Right. I think that the existing foumulation

of the law applies fairly clearly to this. The main trouble is that there
isn't an enforcement mechanism; there isn't an attachment to the console
that raises a flag when it's being illegally used.

What concerns me is, in your formulation of the second part of
your question, which had to do with input or output. In the old technology
about all that could happen to a document put into something was that somebody
could take it out and read it. In fact, the only active processing of
documents occurred in peoples' heads.

Now you have an active processor in the world besides the human
brain. So when one thinks of putting information into a computer, say it is
copied into the memory of the computer, then it may never come out of the
computer. But the computer, other programs in the computer, may digest,
extract from, abstract from, even in the future get at the underlying idea
in some quite different terms of authorship and re-express it so that it is
just not discernible, not detectable. No one can be sure that what comes out
ever came from this original source. And multiply that over many times,
disseminate that. Perhaps it's a superior work of authorship.

You know, the computer will have a list of spellings, it will have
a dictionary, and if "gallop" in the input has an "e" on the end--it probably
would have if Shakespeare had done it--it needn't have the "e" on the output.
It can cleaned up in proof.

So it concerns me greatly that copyrights should not fail because
of this kind of disguised copying. But it concerns me even more that, by taking
the obvious step of applying the copyright precaution to the input, one should

discourage the use of computers to bring in many works of authorship and

extract ideas from them, merge them, blend them, play one against the other,

and come out with something which is superior to the voluminous and duplicative,

replicative input. That, it seems to me, is greatly in society's and

mankind's interest, to have tht kind of distilling of the body of the

knowledge. And the body of information, too. But that is what you're very

likety to inhibit, if you solve the other problem by saying we'll copyright

on input.

DR. BURCHINAL: Mr. Lacy.

COMMISSIONER LACY: I think, as just a practical example that might

deal with the problem identified by Mr. Nimmer. Standard & Poor's owns a

data base called Compustat, which has about 70 or 80 facts for each year

for each of several thousand American corporations, back for the last twenty

years, drawn from edited versions of their annual reports. It's available

through Telenet, for example, and typically one consults it to ask questions

about any given corporation or to get a list of all corporations corresponding

to certain characteristics, and that sort of thing. One pays a fee for each

use based on the amount of time he stays connected with the data base.

Now, if a particular propreitor were, let's say, interested only

in the drug industry and was a very frequent consulter of the data base for

drugs industry information, he could, if he chose, connect himself to the data

base and run through the entire body of knowledge in Compustat about drug

companies. It might take him several hours to do it, or maybe only half

an hour or something. It would be one fairly stiff charge.

Now, we would know he was connected to the data base. What we wouldn't know, under present technology, was that he was taping the output from the machine, just like a Betamax can tape a TV program you're getting on your set. Thereafter, he no longer connects with Telenet, he just goes to this and repeatedly uses it himself, from then on, having reproduced the segment of the total data base.

I think that's the practical problem in mind.

COMMISSIONER HERSEY: And he might conceivably sell it to someone else.

COMMISSIONER LACY: Yes, as a matter of fact, not infrequently that sort of thing is then put up in a hard copy list and marketed. In fact, some of it is done under license. We've licensed Chase in econometrics, for example to use it in stuff they publish. Last week's Business Week, if you noticed, had a list of the profits of several hundred corporations in the last quarter. So that's all from Compustat, which licensed Business Week to publish that subset of data base in hard copy.

But there would be no way of knowing under the present form of access what further was being done with the data. We would know you were connected to it; we wouldn't know that you were taping it as the data passed you on the screen. We could probably tell if you were doing a simultaneous printout because we could tell whether your printer were connected as well, but we woudn't know otherwise.

DR. BURCHINAL: Alice Wilcox, please.

COMMISSIONER WILCOX: Professor Licklider, a couple of evenings ago

you helped me out a lot by explaining how a computer could be a useful thing in publishing. Perhaps you could tell us about your friend who had something on ARPANET?

PROFESSOR LICKLIDER: Well, the other night I was telling the story-- I suppose it is the story of many of my colleagues--but this particular one was about Professor Marvin Minsky at MIT, who published a paper about a year ago called the Frames paper. It's quite a famous paper, and it was famous before it was published. Many of his colleagues read it through ARPANET--in some of the circles on the ARPANET eavesdropping and prying are not socially bad. One is expected to keep things out of his files if he doesn't want everybody to see it.

Graduate students and even undergraduates were combing through Marvin's files and reading his paper and leaving him little notes that it would be better if he said things this way or that. Many people had an influence on that paper, and it came out, I believe, a much better paper because of that kind of circulation.

The second thing is that I'm not sure that the published version of it is going to do anybody any good, because there were many new conceptual advances going on in other people's minds, even before it got published.

COMMISSIONER WILCOX: The other thing you said that was very useful was to outline the steps between the author and the end user, as it is now and as it might be.

DR. BURCHINAL: Do you wish to develop that?

PROFESSOR LICKLIDER: Yes. What I was doing was showing a little graph in which we start with authors and list on lines under him some of his

co-workers. Eventually a publisher, a jobber, a library and the users of the library. I had little arrows going back and forth, showing communications flowing from, say, the author to his colleagues and back and forth until his paperwork was finished, and then to a publisher, and perhaps then back and forth with the publisher and the associate editor. Finally the publisher sends out sets of these books to jobbers and eventually to a library and so on.

And then I plotted the graph that librarians love, that show kind of a declining exponential use with time, after they start the book into circulation. And I tried to show that if you would carry that curve back to the point of real conception, there was a considerably bigger area in the early part of the graph. I was arguing with librarians that they should really get into that hot active time of the technical article and not content themselves just with distribution after it was obsolete and not in much circulation.

DR. BURCHINAL: Mr. Miller.

COMMISSIONER MILLER: A couple of minutes ago we were talking about the risk problem, the danger problem. And I really think the Commission has to focus on that. I thoroughly enjoyed this morning's session. I have, from time to time, lain at the feet of Joe and -- I think I'm entitled to call him -- Lick, and I never ceased to be amazed at how illuminating they can be. Maybe it's just that, as a naive law professor, I'm dazzled by your "computerese."

PROFESSOR LICKLIDER: From one of the great jury lawyers of all times !

MR. MILLER: But, you know, in a curious sense, everything I've heard this morning -- I think I share Mel's reaction -- everything I heard this morning confirms my judgment that we didn't hear any new copyright problems. We have, as a Commission, been focusing on copyrightability, input/output problems, and so-called machine-generated works. And I know that would bother Joe tremendously, but you and I know what we mean, don't we, Joe?

What this morning did do for me, I think clearly, was to crystallize the fact that the dimension of some of the traditional copyright problems is altered dramatically by the new media. You put it beautifully a few minutes ago: we've got a pendulum swinging. The pendulum at one end swings to those who want to free up the input and to exploit the media and develop forms of productivity, intellectual or artistic productivity of types hitherto unknown: the interactive teaching book, new colors, computer graphics, that sort of thing.

When the pendulum swings the other way, we have a lot of people, from industries that have been with us a long time and are vital to the economy, and who are very much concerned about the impact that that will have on their forms of productivity. So they don't want to free up the input or are concerned about freeing up the input.

And across that pendulum one has the risk at one side of mass pirating, and the risk at the other side of that swing of so rigidifying access to the new media as to deter, delay, and debilitate the ability to exploit those media for generating new intellectual and artistic works.

What I see mentally as a marching order for the Commission is some real coming to grips, which I don't think we've done. I think the conversation of the last ten minutes illustrates that we have not come to grips, really, with assaying those risks.

Now, there are a bunch of risks. Dan mentioned one of them. You have a computer system functioning, and you have a licensed user at the other end. And the licensed user can do any one of a number of things. He can use it according to the license; no real problem, no new risk. Or that licensed user can drain off--that's what Dan was describing--a subset of the data base he's interacting with. And, in a curious sense, makes a new data base. Right? Makes a new data base. Maybe applies new software, new control mechanisms for the new data base, but it's basically a subset of that copyrighted original data base.

PROFESSOR LICKLIDER: Or something merged from that and subsets of others.

COMMISSIONER MILLER: Okay. That's where I think I was going. He can take the new data base and use it a thousand times without compensating the licensor a penny. Because that's never going to show up in any accouting method you're going to build in to the original system. That's one risk that the original licensor, copyright proprietor, has.

Or he can take that drained-off subset of the licensor's data base, merge it in an almost infinite variety of ways with other pieces of other data bases to produce what you and I would call a derivative work or compilation.

This sort of compiled data base is a new data base, and it may be done so effectively and so extensively that the sources are totally disguised.

Someone might take that data base, open up a service bureau, and start licensing it to third parties on the outside. That's a real risk.

The final risk, in a generic sense, is that when he drains off a piece of that data base, he simply replicates it and sells it. I don't view that as a real risk, simply because that's exactly the same problem we've had in disc legging and record piracy, and we're going to have it in video disc piracy and the Betamax; that's a classic problem.

The other two are real risks to the copyright proprietor who owns that data base. The question for this Commission is: How big a risk is it? Is it an antisocial risk? Is it a risk that can be dealt with under the traditional doctrines of the law of contract, private arrangements, or should the law of copyright, in some sense, step in and insist on some type of policing mechanism, some type of licensing arrangement built in the original arrangement, so that the risk is sort of socialized over every user of the system. We could say, "Look, there are going to be 10,000 users, two of them are going to be pirates, and all 10,000 of you are going to pay a sub fraction of the risk of piracy, or some other scheme?

That, it seems to me, is something the Commission has to think about and propose.

COMMISSIONER HERSEY: To get to the fundamental thing about the range, the spectrum of risk, does it not, then, make better sense to attach

risk, in this dynamic explosive field, to one form of protection, and the risk in the sluggish resistance, the rigid field to another form of protection?

COMMISSIONER MILLER: The old "special statutes" shtick.

[Laughter.]

COMMISSIONER HERSEY: Or perhaps no new statutes. Except possibly the Ribicoff bill.

COMMISSIONER MILLER: In all honesty, John, I can't answer that question. I don't have the--enough background.

COMMISSIONER HERSEY: Yes, well, that's a question that I think is fundamental for the Commission.

DR. BURCHINAL: The conversation is warming up, there are hands all over the place.

I'd like to introduce just one note myself, following Mr. Miller's comments, and then I think Mr. Nimmer had the next signal.

And I think this is relevant to your response as well.

I would suggest you ask Mr. Levine to locate a recent supplemental or special issue of Fortune Magazine. If you've not seen it, I think it was a wholly paid for advertisement disguised or laundered through some of these communication companies. It's not dated, but I have a copy and it deals with Technology in Office Automation of the Future.

Now, that may seem a little distant from our conversation, but what they have done, in a series of articles in this supplement to Fortune Magazine, is look at the computer and digital technology, at the new developments in

micrographics, the developments in office automation and in facsimile repro-

duction. And through a series of very well-written articles for the Fortune 500

executive type, they've begun to show the interactions of these technologies

and how they will shape our concept of work in the office in the future.

And the point I'd like to make is that the distinction between what

you call old or traditional and what you call new, is so blurred, where you

may have machines -- for office automation, the word processors, whatever we

call these machines today, producing the paper output, producing the magnetic

records, the machine-readable records, as a byproduct, that can go straight

through to a computer output microform that can be held somewhere. You can

have a soft display or you can have a paper display, or you can produce an

electronic display from which you can get paper copy, or you can put that on

a facsimile transmitter and reproduce all or part of that same bit of infor-

mation locally or remotely.

So there is a coalescence of these technologies. I think we are

going to find that we will be capturing, storing and holding information in

different media, the most cost-effective media, at a particular point in

the total transmission cycle. It may move through several different media

in the process of being captured, being stored, being distributed and being

displayed.

Now, the implication of that is there can be great cost-effectiveness

in the over-all system, but, following Mr. Miller's remarks, it complicates,

it opens any number of new possibilities for different forms of copying any-

where in the process.

I don't know what it means in terms of legal or other implications, but I believe, and I suspect the editors of Fortune must have had their heads screwed on right to begin to perceive this coalescence, the merging of the technologies, the different forms in which information will be handled at different cycles in its entire lifespan.

It will complicate everything, much more, I think, than just -- and I don't mean to degrade at all -- than just the computer technology that we've been hearing about this morning.

Mr. Nimmer.

VICE-CHAIRMAN NIMMER: Well, this discussion has been helpful to me, and I think I agree with Arthur Miller's characterization of the nature of the risk. Let me recap for a moment, as I understand it, to see that we're in agreement, and then look at the more difficult risks.

First of all, as I understand it now, the fact that one has been tuning in to a data base and obtaining facts from it can be recorded and one can be charged for this use.

What cannot be recorded is whether or not a tape has been made so that the data base, those facts can be viewed over and over again by the subscriber without paying additionally. What cannot also be recorded is if the subscriber is taking the tape and then selling it.

On the latter risk, I think Arthur is perfectly right: it is really no different than if a pirate publisher starts turning out printed books without permission. Insofar as he's marketing it publicly, it's

likely to come to the attention of the copyright owner, and the usual policing methods will be adequate.

So, also, insofar as he's using just one fact, that's no problem, because he's not going to have to look at that fact over and over again simply because he has it on tape.

The problem arises, as Dan suggests, where you take an entire data base or an entire segment of a data base, make a tape of that, and then use that over and over again so you don't have to go back to the original source and pay for it again. I understand that is a problem now, and it's complicated by the fact that it may be combined with other works, but that really isn't a new problem, that's a derivative work problem, as Arthur suggests.

So the essential problem is the taping and then being able to use it over again without going back and paying for it over again.

I have certainly no thought-out viewpoint on this; but is that very different than if the copyright owner of the Encyclopedia Brittanica says, "Look, if you want to know what year Napoleon died, I'll tell you. If you want the entire article on the life of Napoleon, I'll give you that. Now, I understand that it you want the entire article on the life of Napoleon, you'll have that before you and if in the future you want to know what year Napoleon died, you can look at your copy, you won't have to come back to me and pay me over again, because I've given you the whole article."

Which means, I would think, that if the copyright owner is willing to disclose the entire article, he is then going to charge an amount which takes into account that the subscriber will not have to come back to him

again to ask what year Napoleon died.

So, as long as one can keep track of the original licensing, the original dissemination of one entire subsegment of a data base, and as long as a price can be charged to meet the likelihood that that subscriber won't come back again with respect to information on that data base, does that answer the question of adequate compensation of the copyright owner for that data base?

That's a question and not a statement.

DR. BURCHINAL: Will, do you have a response?

PROFESSOR BAUMOL: Yes, I'd like to respond to several things, if I could.

I agree that basically the change in the problems is in the quantity rather than in the quality. But the quantity is extremely important. That is, normally, if I Xerox an article for myself and I make frequent use of it, and I pay for the Xeroxing privilege in some way, the chances are that my -- if I don't reproduce it for my entire class--the chances are that the number of uses I will make of it will be minimal. It's not going to involve that big a difference if you who use the article twice in the future pay the same as I who use it ten times in the future.

But when we get to your question about what is the social interest, I think the very change in the quantitative magnitudes make a crucial difference of what is in the social interest.

Because, after all, the name of the game from the point of view of society is the balancing of two considerations. On the one hand, you want to make the products of new thought as widely and as freely available as possible,

that's the purpose of having low charges or encourage its use in other ways; and on the other side you want to encourage investment in production of these new ideas.

So the object is to provide through copyright a sufficient stimulus to encourage the flow of new material, while, at the same time, not creating too onerous a burden on users, such that would actually discourage their use.

And of course the wider the number of users and the more you can latch onto those who have the ability to pay, the less will be the discouragement and the less will be the burden. That's the crucial matter. You're trying to charge in such a way that you do stimulate production without inhibiting use.

Now, if, in fact, there is a user to whom that use is going to occur a thousand times a week, and millions of dollars will be at stake, some firm uses the Compustat tape for commercial purposes, and has been charged only once for the use of that tape, whereas you, who are going to run, to base one article on it, as I have once done, has been charged exactly the same amount, you see, that isn't quite -- even though there is only a quantitative difference between ten and two uses of the Xeroxed article, that quantitative difference has changed the nature of the problem.

But it seems to me, one final point, therefore, that it really does become important to hunt for ways in which, in fact, you can keep some sort of track of the magnitute of reuse of those "Batamax" tapes. And that is something which cannot be solved by legislation. Just as in the pollution problem, we cannot solve them by legislation until we know who causes what emissions.

Here, the crucial question, I think one of the top priorities in research, has to be the research in monitoring techniques. How can you solve

that problem in the future, of knowing when somebody is using what? That is going to be the key. I keep emphasizing the analogy to solving many of the environmental problems, and I think this is going to be the key to the copyright question.

You have the laws that can deal with it if you knew how to keep track of who was doing it. What you don't have is the way it can be monitored.

DR. BURCHINAL: I think Mr. Lacy and Professor Weizenbaum have both been trying to get in here. Mr. Lacy first.

COMMISSIONER LACY: Before resuming serious discussion of the subject, I would like to say that I wonder if John Hersey has not been playing the role of the bright typesetter.

My assumption, when I saw the spelling of "gallope" on the board was that this was indeed a very bright and aesthetic young girl who undoubtedly took ballet classes and loved puns and was charmed with the thought that she had programmed her horse to perform a gallope, as she might have done, since peacocks can do a pavane--and I'll hang onto that thought.

[Laughter.]

COMMISSIONER LACY: What I'd like to do is make one very brief comment, if I may, on something Dr. Licklider said earlier, and then toss perhaps a new kind of--not new, but a somewhat different shape of the question on the floor.

Dr. Licklider has spoken of the problem of copyrighted input/output as though he were under the impression that a toll would be exacted on input into a computer system.

Of course, the characteristic arrangement that has arisen on a very large scale is that, though the permission of the proprietor is obtained before any data base is inserted in a computer system, input into it; by physical necessity he's got to pay for the stuff to get the tapes and he's got to get his permission.

The payment is calculated on either the amount of time spent scanning it, or the number of hits drawn from it, and nobody is charged for what turns out to be useless input. And this is a fact that has proved to be a uninhibiting workable arrangement, and indeed what would be inhibiting would be an arrangement where one felt that if his data base were input, he could exercise no control over the arrangement made at that time as to whether it's going to be done and what can happen. I'd really like to look at another thing. The real question before us socially to some extent is not merely what technological potentialities exist, but to what extent they actually become used, and to what extent they become operational in the society.

And a lot of factors, institutional, legal and economic, control that. I think we have all recognized, for example, the extreme resistance in the educational systems to the introduction of new technologies, at least three centuries after Gutenberg reported on the substantial use of printed books in ways that it really amounted to much. So television has penetrated every crevice of private life, it's bounced off the school system and is a trivial sideline with no real penetration in schools unlike all the other media. And there are institutional reasons in the way the educational system is set up that makes that true.

But, in the private life and in the business life, there are not nearly so many institutional interventions, when all these new technologies have found little or no use in the educational system, have in fact penetrated these.

And some of the factors that determine the input or the question of cost effectiveness, and the question of the willingness of the State, as a matter of public policy, to override cost effectiveness and subsidize systems that are not cost effective in terms of what users are willing to pay, because the State wants them to use them, whether or not.

And the third factor, as I said, of legal matters, with one little piece of which we really are concerned. The legal question we are concerned with: Is copyright one that stimulates, or inhibits, or guides the rate at which these new technologies are going to be used in society?

I'd like to say one word about the economics. Dr. Baumol was pointing out the built-in, rapidly increasing cost in the arts because of the lack of productivity. Well, this depends on whether what you are measuring is the man-hours of performance of Haydn or the man-hours of listening to Haydn.

If you are measuring the man-hours of listening to Haydn, then the cuts have been one of the most phenomenally productive devices going. When a Haydn quartet played to 100 people at the court, it was two man-hours for the quartet divided by 100 listeners, a fiftieth of a man-hour for the performance cost to each listener. When ten million people hear it on radio, of course it becomes an infinitesimal fraction, amazingly increased productivity.

This is true in print. A proofreader or copy editor who edits Harold Robbins' novel is obviously being infinitely more productive than the

man-hours of reading resulting from his work, than somebody's copy editing of an MIT Press book. The way to make people in the media productive is to have them produce stuff that lots of people use.

I am saying this half-jokingly, but, nevertheless, it is true that none of the new technology even begins to begin to approach the cost effectiveness in bytes of information that you get for 20 cents from the New York Times, daily. I mean, it isn't in the same, you know, many orders of magnitude are weighed most efficiently. Because you're producing the same information for hundreds of thousands of people simultaneously.

Now, in point of fact, most of the new technology we're talking about is not particularly cost efficient when it comes to one of the objectives that's frequently claimed for it: the widest dissemination of knowledge.

What it is cost efficient at, relatively, is making it possible, at less cost than would otherwise be the case, to do highly specialized, individualized, very small groups, individual dissemination of knowledge. That reduces the cost of high selectivity, which, generally speaking, is the main cost of time, in dissemination of knowledge.

So I think the question we are really looking at is not so much what's going to be the impact of these things in displacing the really quite efficient position of the media for dissemination in reaching large numbers of people with the same message, but providing a remedy for the inefficiency of our communications system by providing rapid messages, highly specialized, to individuals in advanced frontiers of science, where a few dozen or a few hundred need it, or whether you turn pages.

Now, I wonder if it's worth looking at that kind of avenue of access, if that's what is going to be done without -- where the structure is not looked on so much as displacing front, as complementing it with the need for communication to less than a hundred people, or some such fact.

And ultimately there comes a question of what legally you can do with it, and one more word on that and I promise to Lee that I will try to conclude.

In copyright, the constitutional division of copyright refers only to the exlcusive use of the writings; it doesn't say what that use is.

There are a number of potential uses of copyrighted material, and the statutes frequently have provided different kinds of uses to be under the control of the creator, not the same for all kinds of work. For a long time the only use that was controlled was the right to copy it. Then later, for drama and for music the right to perform it, publicly and for profit, in the one case publicly and the other was added.

Only much, much later was the use of literary works to perform, to read poetry for example; only within the last 25 years was that use brought under control. Only with the new statute does the use of the work, to display it, come under control.

Now, it's not at all necessary that the uses that are subject to copyright in some of the new technologies be necessarily the same as the uses that are under copyright controls for other media.

I would think, for example, that they felt that the real use of a piece of music was to perform it, more than to copy it, probably the real use of a computer program program is to use it rather than copy it. I'm wondering

whether there are kinds of ways that the new media can be used to which

copyright may address itself that may different from the kind of uses other

media are put.

DR. BURCHINAL: I know that there was some comment, even while you

were speaking. Professor Weizenbaum has tried to get in here several times.

PROFESSOR WEIZENBAUM: Thank you. I'm grateful to you. You have

given me exactly the hook I need to hang my remarks on. I think it is possible

that a technically motivated error might have crept into the discussion and

that might affect your deliberations.

We are here to talk about information stored in computers and computer

systems. There are essentially three kinds of information that we might be

talking about: programs, data bases and what I will loosely call discursive

works. We might talk about Marvin Minsky's paper, for example, which may be

reproduced. With respect to the first--programs--I think your point is

extremely well taken. When you are latching on to somebody else's program

in a remote computer, what you are buying is behavior. You are not copying the

program. If you attach a tape recorder, you are not going to get anything

that you can use. You are buying behavior. You are using the program and

that is what you are taping. Now it may be that you can sneak into the

computer somehow and copy the program that causes, if you like, that behavior,

but that isn't going to do you any good at all because that program is going

to be incomprehensible in raw machine form. There's a question of computer

language, that is a higher level language that has come in here. Let me

me just assert, just by authority, that it's useless to simply copy a

program in machine language; it can't do you any good.

PROFESSOR LICKLIDER: Unless you just want to run it in a similar machine.

PROFESSOR WEIZENBAUM: As Lick says, unless you want to run it in a similar machine. Forgive me, Lick, but that wouldn't do you any good, because "similar" isn't good enough, it would have to be "identical". And in my experience I have yet to find two machines that are identical. Even if so advertised.

[Laughter].

PROFESSOR WEIZENBAUM: As far as discussive works are concerned, I will rest on what Arthur Miller said, that that's essentially the old problem, and I assume that you know how to deal with that. In any case, you should know that that's the old problem, from your point of view.

That leaves us with data bases. Now, data bases come in two flavors, it seems to me. There are fixed data bases. For example, I can make a list of the elementary particles known today and their properties. That's, in effect, a fixed data base that isn't going change every day; perhaps a particle or some property will be added. For example, a table of integrals, and all that sort of thing.

Now, it may be useful and I'm sure such -- I think the Library of Medicine is an example to some extent it has some that characteristic. It may be useful to have a data base consisting of drugs and perhaps how they are to be used. Clearly, if it is to someone's interest to copy the whole data base, then, it's also in the interest of the owner of the data base to publish it. It may be that the reason it exists in the computer is because

it's relatively easy to get at under certain circumstances. But I can, in fact, buy the Handbook of Chemistry and Physics, which gets bigger and bigger every year.

Generally speaking, I think the danger that someone will copy and pirate, in what I understand to be a copyright sense, fixed data bases is very small.

That leaves us with the other problem, that of the data base which is constantly changing. This, I take it, is the characteristic of a data base such as Standard and Poor's. Here are thousands of firms, or at least hundreds, with fixed capitalization, a large number of employees. The reason that any particular datum in that data base is interesting to anyone is precisely because it's different from what it was last week. If it isn't different, then that, too, is interesting. So, for someone to go in and simply copy the whole data base onto a tape and then stick it into his computer is a not very useful thing to do. It is not a very profitable thing to do, providing, of course, that the copier does not have a system of his own into which he first sticks this raw data base and then has the same facilities to update the data base constantly. It seems to me that that should be discoverable.

The important question with respect to such data bases is, what is the data base owner selling? The illusion that has come up before us here is that he's selling the data, that having the data, if effect, robs him of the resource which he is selling.

Well, he is selling the data, of course. But more than that, he is selling the logic which selects the data according to the needs of the ultimate

user. So even to copy the business data base that you were talking about and to copy it in machine-readable form is far from sufficient. It is very, very far from sufficient to go into competition with Standard and Poor's.

The really hard part, as I'm sure the Telenet people will tell us, is to write the system which in fact makes the data available to the user in a form that the user can use. I think you should understand that clearly; otherwise there is likely to be a little confusion.

DR. BURCHINAL: And I think you would further add, would you not, Professor Weizenbaum, that it is not only the data base, the logic, but that there is a whole intellectual and business process behind it which allows that data base to progressively updated. That's another part of the enterprise which makes the data base unique, valuable, and why people are willing to buy it on-line.

PROFESSOR WEIZENBAUM: I meant to include all that, I guess. I meant to include all that in the word "logic." It's not the data by itself, which is virtually useless. Let me put it another way: this is the difference between information and data.

Let's take the Moscow telephone directory. I understand a few copies of it exist. It is full of information. Now it may be that it's full of data for the American intelligence community, but that information is transformed into data only in the light of a hypothesis.

Basically, at the most fundamental level, what the data base purveyor, Telenet for example, or Standard and Poor's is selling, what they advertise, is their set of hypotheses. An example of this would be what constitutes

an interesting fact about business and how two facts in business are related. All that's included in the logic and has to do with whatever genius goes into creating whatever is ultimately summarized by the single firm's data base. It's really very much more than that, and it has to be clearly understood.

VICE-CHAIRMAN NIMMER: I find Dr. Weizenbaum's last statement most interesting and most significant for our purposes. I'd like to get a reaction from the rest of you experts to see if you agree on that.

Let me first say what I understood him to say, to be sure I'm right. Are you saying, Dr. Weizenbaum, that as long as there can be control of the on-line reception of material from data bases, so that you know that A is getting material from B, it is not terribly significant whether A is going to make a hard copy of that material. He is not going to be able to use it himself without further reliance upon the data base source. He can't use that data base at his own machine, per se, and insofar as there are changes in the data base from time to time, he's going to have to go back to the original source to find out what those changes are. If he goes back to the original source, there's going to be a recording of the fact that he gets this new information. If I understand your conclusion, that suggests that the existing technological controls are such that one can keep track of the uses and hence enforce the copyright in a data base. Would you agree with that?

PROFESSOR WEIZENBAUM: First I have to say that there are people at MIT and many other places who are data base experts, and I am not. I'm terribly interested in hearing Lick, who knows much more about data bases than

I do, comment on what has just been said.

Let me respond to your question as quickly as I can in this way: if I were in the business of possessing a large fixed data base and I thought that there was a considerable danger that people out there might abuse it in the sense of copying it, I would go to the MIT Press and say, "How about publishing this as a book?" I would dispose of the problem in the way of the Handbook of Chemistry and Physics, or whatever.

VICE-CHAIRMAN NIMMER: Why does that dispose of the problem? You can sell the book, but you get a limited royalty from that.

PROFESSOR WEIZENBAUM: I would dispose of it as a different new legal issue. That's what I meant.

If I have a business data base, of the Standard and Poor's variety, for example, such as many of the data bases sold by Telenet, where the central fact is that it changes, my position is that I wouldn't be too worried. Perhaps I'm being naive; I'd like the technical people to comment. Whatever that means legally, and whether or not I would be worried twenty years from now, I don't know. But I wouldn't be too worried now.

Let me give you a very fast example. There is a marvelous program that is probably one of the greatest programs in the world today. It just happens to be at MIT. I'm thinking of Joe Moses's so-called Maxima system which does applied mathematics very easily at the level of very superior applied mathematicians. One of the things it stores, among other things, is a table of integrals. That is a very minor thing. Moses could sell the service of doing applied mathematics, but it wouldn't do anybody any good to copy any portion of that program.

So from a programming point of view, if I were Joe Moses and if I were running this as a business, I simply wouldn't worry about anybody pirating the thing, providing that I could always tell that somebody had used ten minutes of its time and charge him for it.

In the dynamic data base business, as I said, under present conditions and under forseeable conditions, given the nature of the business, I wouldn't worry very much about somebody abusing it in the sense of copying large blocks and trying to then fit them into his own data base.

PROFESSOR LICKLIDER: I'm in the authoritative position of occupying an office at MIT next to the office of the data base expert, Michael Hammer.

[Laughter.]

PROFESSOR LICKLIDER: From that vantage point, let me say that I think Joe has made some excellent points. I am particularly impressed with with his bringing into this discussion that it's the logic, the apparatus on control of the data base, as much as it is the content information of the data base that the proprietor is dispensing. On the other hand, there is a kind of data base in the world of libraries and information systems which is the collected literature of science and technology. The big problem for a firm entering that area is to catch up with today. It would be very easy if he just entered today and got everything into computer processable form and assigned descriptors to it, catalogued it, made it available. But the problem of moving into the field is to get all of the material that's in the printed medium into the computer.

We were at a library meeing in Pittsburgh where it was said that there were 343 such data bases. They all have diverse control apparatus,

different sets of descriptors, not the same man/machine interaction languages.
If somebody could steal the contents of those 343 data bases and make
one really good big library scientific and technical data base, the he
could well afford to build the logic to do the cataloging and make a new
set of descriptors. 'I believe the world would be much better off for that
bit of piracy. But you probably ought to protect against it anyway.

DR. BURCHINAL: The Russians are trying to do that. They have not
been very successful.

Chuck, did you have a comment?

MR. GOLDSTEIN: Yes. I take some excepetion to Professor Weizenbaum's
analysis of the ease in how to use the data base systems and their
manipulation. As it was pointed out in the one model you mentioned, it is
true that those data bases whose usages are determined by some simulation
model. It would be very difficult for someone to reproduce them. But those,
in reality, are very few.

The technology is really moving, and we are forcing it very actively,
in the direction of distributing the same data base handling capabilities to
all hierarchy and other systems in the computer processing for the exact
purpose of distrubuting data base capabilities. Right now I have a minicomputer
that can log onto any network as a terminal. It looks like a terminal to any
data base, and I can bring out into that minicomputer any data base which I
can log on to. I don't think I can steal from it legally--not legally--but
I can program my minicomputer to give me a weekly update on things which are
new.

We are actively and legally working on some other very interesting

things that we want to do. This gets into what Professor Licklider was talking about. We are improving the capability to search very large data bases, to extract in machine-readable form subsets of them in order to form a cluster of analysis on subsets, to gain more specific information which we couldn't gain in a host facility.

The trend of the technology is really counter to the example you gave. It would be very easy not only to access most of the data bases but to keep them up to date automatically, if one should desire to do that.

PROFESSOR WEIZENBAUM: May I respond to that technical point, please?

DR. BURCHINAL: Yes, please do. And then we will come to Mr. Miller.

PROFESSOR WEIZENBAUM: I agree with your technical point, but I don't see the distinction between that and my running a service where I publish, for example, a financial newsletter. I pay the people from whom I get what, from my point of view, is legal information. And, by the way, when you go to the base to get the update automatically, you of course are paying for it again.

So I don't consider that stealing, any more than if I access your very, very large data base and do extremely sophisticated selection. I pay for all that access. And then I finally publish a book which gives an entirely new analysis of what's going on in economics, or whatever.

Well, naturally, I'm obligated as a scholar to give a reference saying where I got the data, and I have paid for the access. Does that

constitute violation of the copyright law?

MR. GOLDSTEIN: To bring up the real question, it's not accessing it the first time, but, as we've discussed, it's what you do with it afterwards. That's what these gentlemen are discussing. If I sell the services, then obviously I'm infringing without the original author's permission or license.

If I do what you said and use it in something else or it's brought up as a derivative work....I can only bring up the capabilities which you alluded to as being so difficult as not to be economically viable.

PROFESSOR LICKLIDER: Could I just say the derivative work could be a single corporate decision, a yes or a no. It doen't have to be something that is then further subjected to copyright provisions.

COMMISSIONER MILLER: I don't want the Commission to fall into the trap that so many deans do, of listening to the last voice to reach their ear. We have had testimony on this subject on at least two different occasions. We had testimony at least a year ago by some data base proprietors who asserted to us that they were being subjected to two kinds of ripoff: one would be the unlicensed user getting at a licensee's terminal. That's not a unique problem. The other was this problem of the data base drain-off that we have been talking about. We did receive some testimony. I suspect that if we went back to the record, we would find that it would be in the fixed data base environment of licensees draining off and making sequential uses from the drain-off and not compensating the proprietor for those subsequent uses. All of which is related to a question of whether you want, as Dan Lacy put on the table, to move your copyright regime beyond display into a use-compensation format.

COMMISSIONER LACY: I believe I could illustrate the point with one tactical example of what you're talking about: the ripoff.

COMMISSIONER MILLER: I guess I'm glad we had this discussion, but it does strongly suggest that we still really don't know what the practical facts of life are in terms of the magnitude of this risk.

If I buy the Encyclopaedia Britannica and I take it home, I assume the publisher, being healthy, wealthy and wise, has factored into his selling price to me the notion that he isn't ever going to get another penny out of me to tell me that there was a Battle of Hastings in 1066.

But arguably, when a data base proprietor licenses me access to his Encyclopaedia Britannica in machine-readable form and says, "You're going to pay by the use, fellow," he has some notion in the back of his head that each time I ask the machine, "Was there a Battle at Hastings in 1066?" he's going to get an additional fee. If it is true that there are people who drain off those facts germane to their day-to-day vocation, they will say, "I'll pay once for the drain-off privilege. But he's never going to get that second and third penny out of me for the repeated usage." Now this was asserted to us as a real problem for data base proprietors.

The second testimony we received in sunny Southern California, on a beautiful day, presented by a beautiful woman--supplied by Mel, of course. She was in the consulting business and she asserted that, yes, indeed, that was precisely what she did in terms of reference service.

DR. BURCHINAL: Who wants to follow that?

COMMISSIONER LACY: I just wanted to say, if I could one final thing.

Another problem that we haven't mentioned is that there are many data bases that need permanent, not changing data, such as a table of logarithms. Standard and Poor's has been mentioned before. It is updated quarterly. The way it is normally marketed is not by maintaining a single source to which there is on-line access, but the whole data base is sold as a tape to a number of active users under license as to what they can do with it. Various programs, screens and so on permit them, by batch processing, to extract certain things. The licenses usually restrict resale of the material outside of their own provinces.

As long as copyright protection is questionable, people are under some inhibitions about marketing in that way. They tend to lease the tapes rather than sell them. They worry about it getting into the hands of third parties not bound by a contract, and there was a sense of the need for copyright protection that would encourage the marketing of data bases in tape form rather than buying them merely on-line access.

COMMISSIONER DIX: This is a slightly different topic, and I'd rather hold it if this other discussion can be continued, because I think it's fascinating and important. But if we are through with that, I'd like to introduce my slight variance.

DR. BURCHINAL: Mr. Miller, did you wish to have a further comment on that?

COMMISSIONER MILLER: I'm in an awkward position, and I beg the Chair's indulgence, because I have to flee the jurisdiction in about ten minutes.

DR. BURCHINAL: Please, then have the floor, and we'll come back to you, Mr. Dix.

COMMISSIONER MILLER: There's another side to this equation that we haven't touched on. I think it was in effect raised by some of the points Lick made this morning, some of the notions that he's presented to us this afternoon. We've been focusing on the risk to the proprietor of the data base as one of these enhanced problems created by the new media, maybe not a radically or conceptually different copyright problem, but just one of a different dimension than we faced before. If you view these systems as interactive and subjected or subjectable to infinite variations of packaging, let me suggest that there's an increased concern even assuming you can generate a payment scheme about distribution to the creator. That's the side of the equation we didn't touch on. I think you were very much concerned about that this morning.

I am an author of a teaching book in the arcane field of civil procedure. There are about 200 or 250 law schools in the United States and I have been blessed by the fact that my co-teachers of civil procedure show infinitely poor wisdom and a lot of them use my book.

Some day that teaching book or a variation of it may be reduced to machine-readable form and become accessible in law schools around the country and be used by the three to four hundred civil procedure teachers in the United States. And every civil procedure teacher will want to teach it in a different way.

Some of them will simply rearrange the chapters, teach it back to

front, front to back and middle to the extremes, chronologically, what-have-you.
But many of them will say, "You know, this chapter would work better if I
pulled out this case and slapped that case in. Or I ask 18 different
questions, or I added this new case just decided by the Supreme Court of the
United States." And suddenly my teaching book, which exists now in nice
hard cover, and the only risk I run is the used book market, will have become
transmogrified in perhaps 200 different teaching books, only pieces of which
are mine. I think there is a question here: are any of those infringements?
You, in your social consciousness, will say, "No, this is what it's
all about." I would say, "I've got to send my kid to college."

Of course there are infringements, or at least royalties are due.
How much in royalties, and how much do these other people get? I don't know
whether that's a copyright problem, Mel, I mean in a statutory sense.

VICE-CHAIRMAN NIMMER: I think that certainly it is a copyright
problem, Arthur, but it's not qualitatively different from the problem we
faced in the pre-technological age. Any time somebody takes somebody else's
work and omits some of it and adds some of his own, we get into the derivative
work area, unless all that he's copied is the fundamental idea as distinguished
from the expression. You know very well the distinction. So you would have
to look at what this law professor did with your work, find how much he took
of your work as compared with how much he contributed of his own and make a
judgement. Probably it would be an infringement if there's enough of your
work there to make it recognizable as being your work, I would guess, though
it becomes a factual question in each case. That's always the case in any

copyright infringement or alleged infringement: how much did he copy?

COMMISSIONER SARBIN: I think, however, Mel, that it becomes easier, more acceptable, routine. It is simply a part of what everyone expects to do, and therefore it may be much more of a problem than it was in the pre-technological days.

VICE-CHAIRMAN NIMMER: Well, I suppose in a way that's right. But aren't we back to this point: if one can be aware of the fact that Arthur's work is being fed off on-line into the University of Iowa Law School, and, as long as we know that the civil procedure teacher at Iowa is on-line with his material, then we have notice that there is a case there. This is subject to seeing what the final materials that the Iowa teacher has and how much of it is Miller and how much of it is the Iowa teacher's.

COMMISSIONER MILLER: It's back to that pendulum that I was swinging in my head before. I want, and I think it's socially desirable that other civil procedure teachers do what I have described, to enrich the teaching of the subject.

VICE-CHAIRMAN NIMMER: But you do want to be paid.

COMMISSIONER MILLER: Yes, but I do not want to create any in terrorem device that will deter them. I really don't.

VICE-CHAIRMAN NIMMER: Well, then, can't you simply announce, or have your publisher announce, that it is permissible to take this material and intersperse it with your own material, subject, of course, to payment of the royalty for the use of the original material?

DR. BURCHINAL: Mrs. Barbara Ankeny. We've had one good idea today.

MS. ANKENY: I'm glad Mr. Miller brought this up, because it seems to me that so much of what we have been talking about earlier, especially about whether program software is copyrightable, would fall under the "works for hire" category. Often questions that might come up in copyright litigation or in courts would be based on this "works for hire" provision because so much of the software is owned indeed by large corporations. People work for large corporations, and the firms own their product.

I think there is a whole different bunch of people who deal also with new ideas, and these are individuals: a man who writes a textbook, a man who writes a novel. You made a distinction between the fixed data bank and the dynamic one, but in a way you have seen novel go into the fixed part and then when they are bought by the movies they do indeed change the ending. They change the whole silly thing and they make a new creation. The author is recompensed in some way for his idea, for his establishing a character that begins to do silly things on the screen. I do not see this taking place in the new copyright. I don't see the the protection for an individual creator, author, or entrepreneur between these two systems of the fixed and the dynamic. And I would think that is something that the Commission has to worry about, not just works for hire and large corporations.

PROFESSOR BAUMOL: Going back to Mr. Miller's point: I think this very last point, the trade-off between encouraging usage and multiplication of your book and the desire not to be "ripped off" but to get payment, I think it's not a new problem. That's the problem of all copyright, and there I think you need no new instruments. You needn't worry about the new

techniques. There you have two variables, which are the amount of payment and the length of copyright. Both are potentially, at least in principle, continuous variables. Presumably the trick is to find that optimal value of those variances.

I think what's special about today is not that we have that tradeoff problem, because that's always the essence of any sensible decision of copyright. The factual point at issue is whether or not these new techniques either permit or encourage use without compensation in ways that did not occur before.

It may be true, for example, that anything that can now be done could have been done in some way without the new techniques, but the new techniques make it more customary, make it possible for people to do it without pangs of conscience, whatever the reason. The really special problem, the one problem that one has to address is the combination of issues: is it true that with the new techniques there are in fact more areas in which you are likely to get infringement of what you would like, and second, what is the possibility of getting devices to keep track of that sort of use?

DR. BURCHINAL: I would imagine, Will, extending that one step further then, even if the technologies might encourage greater access, the question is: is that an economic detriment to the proprietor, in effect?

I've just gone one step further from what I guessed was implied by your remarks.

PROFESSOR BAUMOL: I agree.

DR. BURCHINAL: Fine. Chuck.

MR. GOLDSTEIN: I guess I don't really see the problem that's been raised as being different from the existing situations. If you will take the scenario, the final step, and say that such a text is being given on-line with a royalty payment basis for its use, for its each-time use. If you don't do that, then you're saying you're selling it for a one-time utilization, however you want to use it.

Predicated on its being provided on a royalty-per-use basis, then if an instructor takes it and modifies that text, he has either the alternative of charging his own royalty, which is an obvious situation, or giving it away free. Then you have an equally obvious situation if he is infringing upon something which is copyrighted.

I think the enforcement of providing the royalty arrangement makes it analogous to a text, but in the educational market today these programs are not being paid for on that basis. So the subject simply has not come up.

VICE-CHAIRMAN NIMMER: Well, how do you structure a royalty if you're not aware of how often the licensee is using it?

MR. GOLDSTEIN: If it's in a computer, you are aware of how often it's accessed.

VICE-CHAIRMAN NIMMER: Right. It's just that I thought that you were talking about the taping and reuse.

MR. GOLDSTEIN: No, we're talking about legitimate use of a computer-based version, by a professor for his class, rather than the

professor buying or telling his students to buy ten copies of the text.

CDC is doing that right now, and they're paying royalties to authors. As soon as you start paying royalties you have to identify the utilization of copyrighted information. That would come out in the same way as a professor taking excerpts of hard copy from a text, copying it for his class, distributing it for free--or charging for it, either way. It would still be a copyright infringement.

DR. BURCHINAL: Mr. Dix.

COMMISSIONER DIX: This has to do with Arthur MIller's pendulum again, and also with something Mr. Licklider said earlier that I don't think we've quite latched onto yet.

This could come up, conceivably in the future, when large quantities of full text are stored ina computer. The question is whether the growth of that desirable condition and its use would be inhibited by some sort of required payment at the point at which it's put into the computer. I think of two or three analogies that contradict themselves here. One analogy might be the bookstore, into which you go and browse, but you don't pay until you buy the book.

Now, what's wrong with the analogy is that somebody, the bookseller presumably, may have already paid for the book before you browse in it. But you suggested, I think, Dr. Licklider, that it might be possible to conceive of a situation in which one might browse directly in a large amount of text in a computer. But the royalty would be expected only when you made use of something, having selected the full article or the full unit of text

that you wanted. Technology might make this possible by some device of a short memory that would erase the browsing traces that you had left, as it were.

I just wondered if you would comment further on that. If I understood you, you seemed to be suggesting that it might be desirable, socially desirable, for large masses of text to be put into the computer without any royalty being paid at that time.

PROFESSOR LICKLIDER: I was trying to see two opposite problems at once, and I made it confusing by getting the two of them mixed up. Let me try again briefly. Mr. Lacy was substantially correcting my view of what was involved in paying royalties at input.

COMMISSIONER DIX: But he was speaking of data bases in a different sense, you know, in using full text.

PROFESSOR LICKLIDER: Yes. One desirable model, especially in science and technology, would put huge quantities of full text into a big computer, and then have very discerning retrieval programs which could find the ones particular users needed. Nobody need ever pay any royalties on those articles that were of so little substance or so little pertinence that nobody ever needed them. So that's one model, and that says, let's get some way of paying on output.

The other model is one in which the fundamental concept is to protect the underlying idea. This is what scientists and technologists are interested in, rather than protecting the artistic expression. In trying to serve them, one would want to get all this text into this computer, because

that is a much more workable, organizable form of representation for the body

of knowledge. It would take one pass at all of that text, and never again

need it. All subsequent references would be to this different organization.

I say that poses a copyright problem, because you have all those

people who are wanting to be protected. They think their work is going to be

used many times, but in fact the technology will make it so they get used

only once.

COMMISSIONER DIX: We must ask Mr. Nimmer, I guess, what the

present legal situation is under the new law on the input of copyrighted text

into a computer.

VICE-CHAIRMAN NIMMER: Under Section 117 of the new law it's

made very explicit that the new law is the same as the old law -- whatever

that may be. And nobody knows what the old law is.

[Laughter.]

COMMISSIONER DIX: Yes, that is worth discussing.

DR. BURCHINAL: Professor Licklider has introduced a fascinating,

complex and rather exciting set of possibilities. I will beg your indulgence,

since I'm serving as Chairman, for a little presentation.

The National Science Foundation is supporting a wide variety of

projects. I can think of about ten very quickly that are really dedicated to

the principle of trying to help make happen what he has described.

Now, we've made the assumption that this is in the public interest,

that being able to have the capability to try to create what we call a degree

of transparency, so that the user who isn't a real computer buff would be able

to sit at a terminal and have a set of aids built in to the terminal, to the

network, to the data base. One would be able to move across data bases as they are constructed today; these are largely abstract indexing systems.

Through subset clustering, through a variety of other devices, one would be able to identify the particular articles of relevance that may be scattered across a variety of these data bases. Then perhaps one would be able to look at those abstracts and be able to go into the passages of a text or the particular tables that would contain data, information, hypothesis, generalization, mathematical expression, whatever the form of that reporting happened to be. This is all looking ahead, of course, and assumes that a great deal of that text also is in computer-readable form.

Now, this is a long-term gleam in the eye of many researchers: that one would be able to go, in varying levels, from superficial pass, richer possibility of derived or potential information of value down to particular forms of information. Researchers are exploring this. Combinations of people, information scientists, computer scientists, network people and so on, are studying linguistics, the way scientific language coheres, and what terms and expressions are related to others.

But what all of this research is posited on is the assumption that this is the way our information and our knowledge, at least in the scientific, technical, biomedical fields, will be stored.

Now, the researchers aren't concerned about the copyright issues, who is going to own, and when do you give up your rights, and how do you get paid for whatever use. It is assumed that these problems are going to be solved as we go along.

Now, that may be a very rich assumption, but I thought it might be worth just developing a little bit on Professor Licklider's comments, because a wide variety of people at a number of institutions are working on this assumption. And I'd add just one further note--this capability is not that far away. I don't want to try to be an oracle or anything, but it isn't just infinitely away, it is somewhere in the near future, say five years or ten years.

Just to bring it one step closer, I could illustrate with one experiment that the National Science Foundation is funding with the American Institute of Physics. AIP claims to be the single largest scientific publisher in terms of numbers of pages or words or something. Mr. Lacy, maybe you know.

COMMISSIONER LACY: They are way ahead of us [McGraw Hill].

DR. BURCHINAL: That's their claim, and I guess it's well established.

In their journals, they capture all of the information that is the forepart of the article, that normally appears in the abstract or indexing service, in machine-readable form. They also capture all of the references, at the tail end of the article. They call this the "heads and tails".

That's available in machine-readable form, and when the actual article is printed, that part is pulled out of the machine-readable record and mixed in with the other form of composition. This means that a machine-readable record to the article is available before the article is published. They're still at that intermediate stage that Chuck was referring to.

The experiment that we're funding with AIP is to take a set of engineers and scientists who work for NASA in various research centers out

on the West Coast. Physically they are quite far removed from New York and Stony Brook where the printing and editorial work is done. These scientists will be able to use the services offered through Systems Development Corporation or Lockheed, to search the SPIN tapes, to identify articles. Those that are already published presumably will be in the local library. They will be able to identify articles that have gone through editorial and peer review but are not yet published. Then, through use of the NASA satellite, they will be able to obtain those in full text facsimile, so that there's a complete, more complete integrated form of information transfer.

All of this is protected by AIP's own copyright. I thought this experiment brings the future a little closer, because this is what they are going to be doing next year.

A scientist would sit at a terminal or with some aide, search the literature, get the published part of it out of the conventional library, and have the other part delivered on a printer device from a remote location.

Mr. Applebaum.

MR. APPLEBAUM: In the last five or six weeks, I've attended a couple of meetings where economists spoke to librarians and publishers about the economics of information transfer. One meeting was in London at the British Library Association Centennial. What seems to be happening is that the focus is more and more on the commercial viability of these various systems. This, I think, is the way it ought to be.

Professor Weizenbaum spoke of the fact that it's the logic and the manner in which information is put together and processed and made available for the computer that really is what's sellable. You're selling it when you

sell access to a computer.

The group that's manipulating information to put it into these computer stores is the group that would logically, it seems to me, be paying the author, or the publisher for the privilege of taking the basic concept and storing it.

Somebody who has already subscribed to the computer store and takes it out in such a way as to be comparable to pirating a phonograph record is stealing. I think that, regardless of what the Commission does, this will always be stealing, and the law, I think, will cover such an approach.

This whole business of text storage and retrieval is imminent, there's no question about it. The Library of Congress has been working with MIT in a research and development mode. The second phase is going forward now, and I should think that if text is stored, whoever provides the initial text should be paid for it.

The retriever is like the person that comes into the Library and retrieves a book and uses it. If he uses it himself, that's a one-time use, but if he comes in and gets that book from the library and says, "Here's a chapter that I'd like to put into a book that I am proposing to edit", then he should go to the copyright owner and make a payment.

This is an oversimplification, but if we talk about that pendulum that swings to one end or to the other, that pendulum is going to have to keep swinging. You can't stop it in the middle, because you stop the clock. There is going to have to be, in other words, some type of compensation where everybody gets some part of his due, but we don't stop the process of transfer of information. Economics really should control this. What is it worth to each party along the way?

I'll cite one quick example and then I'll quit.

The Library of Congress produces a data base that's at the same time fixed and dynamic. This is the core of our national bibliography, the National Union Catalog, which is based on the LC printed card, which has been produced since 1901. Now, it appears as a printed 3 x 5 card, sold by the Library of Congress and by a number of commercial firms that do different things to it. It's sold as a book; it's sold as a quinquennial compilation, commercially. It's also sold by a commercial firm through Telenet. If it weren't a desirable feature in that particular mode, it wouldn't be sold commercially.

My argument is simply that all of these approaches, so long as they are economically viable, shoud be continued and encouraged. Compensation should be worked out on the basis of where it can be controlled and how much it is worth to the various parties.

DR. BURCHINAL: John Shoch.

MR. SHOCH: I've been having a little trouble trying to sort out the discussion. I haven't said very much so far about the risks associated with certain kinds of data bases. I feel very uncomfortable with statements that a particular data base of a particular variety either is or is not at risk of some form of piracy.

To piece together some of the comments that people have made, it seems to me that the risk to be encountered is not so much a function of the type of data itself or the way in which it has been organized, but is rather a function of two independent factors. One of these reflects the needs of the user and

the value of the data to him for his particular application. The second is the skill of the user in trying to access the particular data base. These are independent of the way in which the data is organized. Let's take a couple of examples and go through them. Take a service which provides an on-line stock ticker, the kind of thing you all see on closed-circuit TV. It is available through a computer terminal as well. For the typical user, who is merely interested in the current quotation of a stock and is therefore interested in the time value of that particular information or data, there's precious little incentive to saving that data, trying to acquire it and purloin it out of this system which has provided it, since there's no real value to him beyond the immediate time value.

To a different user, however, who finds himself with a need to analyze the way in which the market has been trading in a particular stock, who needs to know if blocks of stock have been moving in unusual patterns

in the last week, the ability to capture that data, to save it and re-analyze it with his own programs, is incredibly valuable. Therefore that data is, all of a sudden, at risk of being purloined.

Another example that Joe Weizenbaum talked about was the Handbook of Chemistry and Physics. For many of us who use that as a reference text twice a year, who need a table of integrals which happens to be in the book, it's perfectly adequate for our use. Our needs do not necessitate that we take any step which might jeopardize the rights of whoever it was that created that table.

If, however, I were a scientist, analyzing the interaction of some particular compounds, and if there were a compendium of information which had

been available in an on-line program, but where the owner had chosen to only

make it available in a bound format, such as the Handbook, then I might feel

an inducement to try to acquire access to his on-line data base system in

order to then apply my own tools to it.

There are other examples. Take the Maxima case, for symbolic manipu-

lation. For the vast majority of users it is perfectly cost-effective to use

the system at MIT and pay whatever the freight is; but it is not cost-effective

for us to go in and try to liberate that entire data base, both with informa-

tion about the way you use symbolic integration and all those tables.

If, however, I found myself in a position where that was what I was

going to do, with twenty computers working full time on that task, the value

to me of that information has changed. Therefore the risks which you would

incur as the proprietor of that data have changed.

Now, I don't have any firm conclusion to where this all goes, except

perhaps as a different perspective on how we try to understand the risks that

we're subjecting the data base to. It's not so much a function of what the

information is or the way in which you organize it, but rather the value

which will be perceived by the user when he tries to get access.

DR. BURCHINAL: Professor Licklider.

PROFESSOR LICKLIDER: Well, I'm still concerned about possible

ways the new technology may eventually introduce new copyright problems.

And I see one that I think may be almost essentially used.

Suppose you have an organization that wants to be an intermediary

in the distribution of information, that wants to collect a lot of texts,

data bases, whatever, and pass them on for a fee to the users. Suppose

that the original copyright holders, the people who own this stuff before it gets into the intermediary's hands, don't want to trust the intermediary, so they give him only encoded versions of their material, but they pass the keys onto the end users.

This bears on the question: Is it a copy, to put in an encoded version of a text or a data base? Is that making a copy?

And I would submit that it would be better to say no, and to say that all of the protection should then accrue to the key. The copyright should be paid on passage of the key, and I think that, in some instances, would make an efficient information distribution system.

DR. BURCHINAL: Mr. Nimmer.

VICE CHAIRMAN NIMMER: Unlike the old law, the new copyright act does define copy in a way that would, I think, make what you regard as the encoded version a copy.

PROFESSOR LICKLIDER: Yes, that's true.

VICE-CHAIRMAN NIMMER: As long as it is discernible with or without the aid of a machine, it is a copy.

PROFESSOR LICKLIDER: Yes, I think it would be a copy under the law, and I think possibly it shouldn't be.

VICE CHAIRMAN NIMMER: I don't understand your reasoning. Why not?

PROFESSOR LICKLIDER: As long as you don't get the key to it, as long as you just have the encrypted version, you can't ever use the thing. You can't get it back. You ought to be able to transmit that freely.

The reason it would be good not to call it a copy is it would

permit this intermediary to get all kinds of information collected, without ever bothering with the busy work of getting copyright permission. This, I suspect, is going to be one of the real problems, just getting the permission.

VICE-CHAIRMAN NIMMER: How would he get it, physically?

DR. BURCHINAL: Yes, Professor Weizenbaum.

PROFESSOR WEIZENBAUM: The technical point that Lick has in mind, also bears on this business that I confess I hadn't thought about, of people actually passing the whole data base to one another, for example, in the form of a tape.

COMMISSIONER LACY: Well, it's a very substantial point.

PROFESSOR WEIZENBAUM: Yes, I just hadn't thought of that. I'm sorry. But it bears on that very critically.

There is a recently developed way of encoding something such that you get the encrypting key, the key you use to make a mess out of it, from the end user, who is the only one who could possibly possess the decrpyting key.

One thing that could easily be done today, technically, certainly, is for the ultimate consumer of this kind of a tape to go to the supplier and say, "Here's my secret, let's call it a password, or rather a secret key" that's a much better word: "Here's my secret key. Would you use this key, please, to make me a copy of your data base?" This is, I think, what Lick has in mind.

The copy is made. It's totally illegible to anyone who doesn't

have the inverse of the key. This is, of course, only the supplier of the key.

Now, the charge is made at the time the end user presents the key to the supplier. That works perfectly well. Then anyone copying that tape is just copying junk. I would say that ought not to count as a copy, because it's simply illegible. Any more than my photographing, say, the Mona Lisa with a lens which is smeared with lipstick would count as copying the Mona Lisa. It's illegible; it's just a smear.

Now, I think what Lick has in mind, and I think it's a rather good idea, is that one could now have intermediaries who deal in these encrypted tapes. Because they are of absolutely no use to anyone until the end user supplies the key, that's where the money changes hands. It might be that the law ought to take advantage of this special technique, ought to take cognizance of it, and possibly charge for locking and unlocking doors, as opposed to charging for whatever happens to be inside the room, which is locked or unlocked in this way.

Is that what you had in mind, Lick?

PROFESSOR LICKLIDER: Yes, I wasn't going to combine the two ideas, because I thought either one was complicated enough, but they certainly do go together, and I'm with you.

DR. BURCHINAL: Let's see if they're going to be complicated further. Professor Baumol.

PROFESSOR BAUMOL: No, I hope I uncomplicate them. Often the point at which a particular charge is made really makes very little difference as to who ultimately pays it; it's really a matter of convenience and collection.

For example, whether a sales tax is paid by the seller or by the buyer makes no difference. If it's paid by the seller, he will raise his price to the buyer, to pass as much of it as he can along. He can't pass all of it along because, by raising the price, he loses demand.

And, similarly, if the sales tax is passed on to the buyer, is charged to the buyer, what will always happen is that demand will be depressed. That part of the charge will be shifted back to the original seller, so that that is precisely why firms will fight against new taxes on their products. They can't simply pass it on to consumers; part of it will be stuck with them, and vice versa.

So here I think the issue as to whether it is paid by the person who has the key or whether it is paid by the person who will sell the material to the one who has the key is a matter of collection convenience. Certainly the one thing that's clear is that you don't want to divide it between them because that's doing what the market is going to do anyhow, and doing it the hard way. You're going to have two expenses here.

PROFESSOR WEIZENBAUM: There's a misunderstanding here. It's not a question of who pays, but it's the question of what's for sale. And what's for sale here is the key, in effect.

PROFESSOR BAUMOL: That is true. If it is a market price, then that price will adjust itself so that the use of the key is what pays. If, in fact, it is charged to the person who cannot use it himself but who will then pass it on to someone who will use the key, the price for the use of the key will go up.

PROFESSOR WEIZENBAUM: Well, yes, I think that's what Lick was trying to untangle, and I tangled it, unfortunately. But I think what we're talking about is the question of control.

PROFESSOR BAUMOL: Yes.

PROFESSOR WEIZENBAUM: The controllability of the whole process.

PROFESSOR BAUMOL: That's right.

PROFESSOR WEIZENBAUM: The encrypting and decrypting business adds an element of control over this.

PROFESSOR BAUMOL: That's exactly the point.

PROFESSOR WEIZENBAUM: The law at the moment apparently doesn't take cognizance of this, and the Commission should perhaps look into the matter.

PROFESSOR BAUMOL: It doesn't matter who pays, except from the point of view of ease of administration. That is the key to it.

MR. SCHOCH: Now, I'm not even interested that it enhances the control. Even if one uses a public encryption system, even if you use this technique to protect yourself from a middleman along the way, that doesn't provide you with any kind of new protection against the end user who reads off the entire data base, and who rightfully negotiates with you through whatever mechanism you have with the encryption and decryption to protect you from the middleman who might get hold of it, but if it is the end user who chooses to do that, this system doesn't seem to provide any improvement, unless I misunderstood what you propose.

PROFESSOR WEIZENBAUM: Yes, I think you're right about that. I confess I'm way beyond my competence. My intuition is that if someone is

really going to buy your whole data base, then you charge accordingly.
I think it was Mr. Miller who alluded to this. You get 10,000 people
who buy it, you distribute the cost on the likelihood that someone is
likely to plagarize it. So you charge accordingly.

DR. BURCHINAL: The point that was introduced here was that
there is, perhaps, one new element that should be taken under consideration,
apart from the traditional notion of ownership. That is a means of providing
"the key" for use of data bases as opposed to always charging for presumed
copying. I gather that was the point, wasn't it?

PROFESSOR LICKLIDER: Let me just fit this into a very
familiar model. I subscribe to the Journal of the Acoustical Society. I
deal with the Acoustical Society to get that journal. I am only dimly aware
that it comes to me from Lancaster Press, having gone from AIP in New York
to Lancaster Press to me.

The new technology might require a substitution of, let's say,
Telenet for Lancaster Press. And I might be reading the Acoustial Society
Journal on my home console.

I would like to keep on buying it from the Acoustical Society, but
it would come to me through Telenet. And the reason I could read it is that,
for my subscription, instead of getting just a little receipt, I got a
receipt and a key. And nobody else could get it out of Telenet without
paying the subscription price and getting the key.

Now, I didn't use a private key but that would mean there's only
a small amount of organizational change, the substitution of one company
for another. But as far as the user is concerned, he gets into the new

technology with essentially the same scheme as the old.

DR. BURCHINAL: Mr. Hersey.

COMMISSIONER HERSEY: I want to change the subject a little bit, in case people want to go on talking about the data base problem. I wanted to come back to Professor Weizenbaum's original statement with respect to programs.

If I understand you, the fact that there is, practically speaking, no incentive to copy, and therefore, practically speaking, no copying takes place, then presumably copyright is not the appropriate form of protection.

The user gets from the owner the use, the active process, what you call the behavior. What would be the appropriate form of protection for the owner?

PROFESSOR WEIZENBAUM: I don't know quite how to interpret the word "protection." If you mean how should the owner be paid, then I suppose he should be paid by some accounting procedure which takes place in the computer for the use of specific modules and the length of use of those modules and so on.

It may very well be that in a particular program when modules which may have required much more effort to construct than others are addressed, a very high charge is made per second. For other modules in exactly the same program, a lesser charge is made. Except for cases of out and out fraud, it's certainly technically possible for the computer to do that kind of bookkeeping. A user is now using this portion of my program and he's using it for ten seconds. You send him a bill. By that time we will probably have electronic fund transfer, unfortunately --

that's another subject.

In any case, that's how the originator of the program gets paid, I would think.

COMMISSIONER HERSEY: Supposing he pays for it in that way, and gets the use of the program, are there other abuses, misappropriations, and so on of which the user might be capable, against which the owner needs to be protected?

PROFESSOR WEIZENBAUM: Well, you know, as the psychiatrists say, if you could think of it, somebody's done it.

(Laughter)

PROFESSOR WEIZENBAUM: It would be very risky to just answer that with a no. I imagine there might be abuses. But it's hard for me to think of it and the extent to which the law should worry about it especially. I think the law in general understands about intents and all that sort of thing. I would assume that if an owner were to become aware of such an abuse. I don't quite know how, but perhaps he would. Then he would have remedies through the legal process in roughly the same way that the telephone company seeks to protect itself against clever people who can make so-called "blue boxes" and who can therefore make long-distance telephone calls for nothing.

I don't think that there's a specific law that took into recognition that these "blue boxes" are possible; nevertheless, I'm sure that the abuse of the telephone system by these means is in fact felonious and punishable, and is even occasionally punished. Usually what happens when the telephone company catches such people is that they hire them, because of their capability --

[Laughter]

DR. BURCHINAL: It's a reward in that sense.

PROFESSOR WEIZENBAUM: Yes.

DR. BURCHINAL: Chuck Goldstein

MR. GOLDSTEIN: Mr. Hersey, you addressed that part of the program which is in machine language, and you pointed out it was of little value to extract that and to remove it. There's another large area whereby one wants to be able to sell and transmit that program in what we call its higher language version before it has been changed to that version which is of no value.

There are many reasons for wanting to do this, such as the reason for selling books. I would like to sell you a program, but give it to you in a form which you may change for your own purposes. I don't want you to take that program that I've sold you and give it to somebody else who might buy it from me, if I'm in the market. Therein lies the contract problem with regard to software programs.

COMMISIONER HERSEY: I'm assuming that subscriptions to source programs, and even perhaps higher language programs in source form could be copyrighted.

PROFESSOR WEIZENBAUM: Yes, I didn't interpret the question that way. You're quite right there is that other problem. But I interpreted the question entirely in the terms of behavior, that in effect you're selling behavior.

There I think we're relatively safe. You're quite right; the

other is a problem that's not unrelated to the problem of protection
of discursive texts.

DR. BURCHINAL: Professor Licklider.

PROFESSDOR LICKLIDER: The whole subject of what a computer
program is and the protection seems to me to require some more
deliberation. I was a little distressed with the old definition and the
new definition in the material that I got a chance to read.

But, for right now, let me say, we're moving into a time in the
hobby computer market when—we're already at the time when a program can
be distributed in a form in which it is almost hardware. It is not, as
said here, a description of the process, it is something which gets
slipped into the computer. And whether it is more like ink on paper
or more like magnetics in a magnetic medium, or holes in electrons in a
semiconductor, doesn't really have much to do with it. That is the
machine level programming, and it is going to be a valuable thing,
because they will be replicated by the thousands and sold in the drug
stores.

So it bothers me for two reasons that you say a program is not
a process, it's a description of a process. The other reason is that in
computer jargon a process is not the underlying algorithm, if indeed
there is such a thing, but the process is this behavior that Joe talks
about, when the computer program is interpreted or executed.

Another thing that bothers me is that it's said that a program is
a series of instructions or statements. We're moving into a time when
it will be an array of such, many columns, each being executed on a

different processor of a multiprocessor. It bothers me because the behavior that arises when a program is executed is controlled only partly by the program, but perhaps equally, sometimes more so, by the data upon which the program operates. There's a big terminological confusion. Some people speak of programs as including data; others speak of programs as operating upon data, say, from a data base, viewed as being separate from the program.

PROFESSOR WEIZENBAUM: What about data-driven programs?

PROFESSOR LICKLIDER: Data-driven programs, yes. And interpreters which execute a very small, simple, general-purpose program which goes and looks at data and behaves as though it were executing the program, whereas it is not actually executing it.

MR. GOLDSTEIN: That's not a good, structured program though.

PROFESSOR LICKLIDER: No. Then, I started to say that there are situations in which several processes in separate computers, perhaps even geographically separated, are in communication with one another. The whole thing has been designed by one programming team, and the whole thing is essentially one program, but not even all operating in the same computer.

And finally, it's not just the program that is either "static" or "dynamic," static for the form that can be written on paper; dynamic for the behavior that Joe was talking about. It may be that the static program and the data that are in the computer at the outset are not the only things that determine the behavior of what goes on. Data are also coming in from the outside world. Many computers operate on, forgive the expression,

real-time input. So there really are three factors that determine what
goes on.

Now, that's enough at variance with what's written in the Sub-
committee reprort that I really think you need a re-examination of what
constitutes a program, therefore, a kind of re-examination of how you
go about protecting it.

It is now possible, with some small effect, to decompile or
disassemble, that is, to go from a low-level machine-like language
program to a higher-level one. In the future it will be possible to
do that very effectively.

If one takes a protected program, a copyrighted program in machine
language or Fortran or whatever level, and moves to a higher level and
then back to a lower level, putting in the specifics of expression that
make the thing a work of authorship, is this newly created thing a derivative
work? Surely it is derivative work in some sense, but all it is derivative
upon was the essential underlying idea of the program, not the mode,
not the form of expression. And so it isn't derivative from the thing
you people are trying to protect.

In the actual world of programming, all people want is the effect
of the action of the program. They don't care a thing for the particulars
of the expression. And it might even be improved in going through that
process. So, I submit, you're probably protecting the wrong thing.

Finally, you say that copyright goes with this expression, what
makes it a work of authorship, whereas patents deals with process.

Now, patents of recent date do indeed deal with process, but

most patents are for things like machines. A machine is something which, when activated, when energized, behaves and produces process.

A program is something which, with these auxiliary comments I've made, when energized or activated, behaves and produces process. So a program is very much like a machine. It's the details of the machine that correspond to the expression which makes a program a copyrightable thing.

What the patent tries to get at is the essence; what the copyright gets at is the more superficial form. I worry considerably whether you're protecting the thing that is really valuable in computer work.

You may pay me later.

[Laughter]

DR. BURCHINAL: Well, that sounded somewhat like a benediction I'm not sure.

[Laughter]

DR. BURCHINAL: I think you are leaving us on a very profound note, Professor Licklider. We have been going at this pretty hard since 10:30; all of us have some limits of attention, I suspect. Mr. Chairman, if you agree, it might be well to end on this note.

CHAIRMAN FULD: I thank you, Dr. Burchinal, we all do, for moderating this session, and our thanks to all of the people who participated in it.

For myself, I must say I'm far better informed than I was,

and it will take me a week to decide whether I'm any wiser.

[Laughter]

DR. BURCHINAL: You got data if not wisdom there.

CHAIRMAN FULD: Yes.

We'll recess until 9:30 tomorrow morning.

[Whereupon, the meeting was adjourned, to reconvene at 9:30 o'clock a.m., the following day.]

The 18th Meeting of the National Commission on New Technological

Uses of Copyrighted Works was held in the Forum Room of the Lamont Library

of Harvard University, Cambridge, Massachusetts, on Friday, November 18,

1977, commencing at 9:45 o'clock a.m., Judge Stanley H. Fuld, Chairman of

the Commission, presiding.

JUDGE FULD: May I call to order the second day of our 18th Meeting.

You have an important announcement to make.

COMMISSIONER NIMMER: I did have, Judge, an announcement that I think

is of real importance and significance to the members of our Commission and to

the members of the legal profession generally. And that is for those of you who

are not aware of the fact, last Wednesday night at Columbia University Law School

there was an announcement of a new endowed chair in law, the Stanley Fuld Chair

in Law. (Applause)

And this is, of course, a traditional way that law schools have of

recognizing those who have achieved preeminence in law; and our Chairman cer-

tainly is among those. We all congratulate him.

JUDGE FULD: Thank you very much. I might say that having sat on a

very busy and harried bench for many years, I welcome the relaxation of a chair.

(Laughter)

We have Mr. Richard Miller with us today, Vice President of Harbridge

House, project director of the survey that has been circulated and which we have

read. We welcome Mr. Miller.

MR. RICHARD I. MILLER: Don't be alarmed by this impressive stack of

materials. I'll show you how useful it is: Mike Keplinger was asking about

some work that was done in Canada and I stated that I had the article by Mr.

Davidson right here. He then introduced me to Mr. Davidson, whom I never met before.

JUDGE FULD: Better be careful in how you describe it. (Laughter)

MR. MILLER: Oh, I shan't. (Laughter) Ladies and gentlemen, I have had the pleasure of meeting some of you before. Some of you are familiar with my firm. We are going to briefly discuss a survey this morning, but you should understand at the outset that Harbridge House is not a Gallup or even a Daniel Yankelvich type firm. We are management consulting firm which uses a survey as a single fact finding device. It has great limitations as a device to secure facts for purposes of management decision making. For my own part, I have always been concerned with the decision making function in the law, and notably the interface of science and law.

Harbridge House has a great many attorneys. We work in interdisciplinary teams with statisticians, economists, and others, to try to understand how the law operates, to try to understand how the institutions of law operate in order to improve both the laws and, from time to time, the institutions which make, apply and interpret laws. This has led us into such varied fields as inquiries on mandatory licensing of patents, on government patent licensing policy, on issues of criminal jurisdiction, and even trying to improve the New York court system.

It also led us some years ago to a project for the National Science Foundation that was concerned generally with legal incentives and barriers to the utilization of technology. The project had an open title and the National Science Foundation did not constrain us in our choice of subject matter. I was the project director; one small item that interested me was what was happening in computer software.

The time was 1973. This was a subject that had always interested me, as well as Bob Bigelow, Roy Freed, and others with whom you are familiar and have heard. (Bob is present today.) I had been active in a group of attorneys who have been fascinated with what the computers would mean to law and what the law would mean to computers, since the two were introduced to one another not too many years ago. And as a result, we decided to conduct a small survey during the NSF project. A small survey was all that was possible because the computer software industry was itself small at the time. I personally had an interest in the subject, which went back for some years. I am a director of a computer software company, so the terminology and the problems of the industry are personally familiar to me as well as professionally interesting.

That study was the first empirical study that had been done. I didn't realize it at the time, although I did not know of any other that had been done. It was a small part of the NSF project. It is only a few pages of the eighth chapter in a report published in an eight chapter book. From a very small sample taken from the Association of Data Process Service Organizations (ADSPSO) we were able to draw some conclusions about the utilization of copyright, trade secret, patent, and other modes of protection.

The survey questionnaire, and for that matter the report itself, were written strictly from a lawyer's point of view, indeed from this lawyer's point of view. When Mike Keplinger happened to refer to the NSF survey at a Computer Law Association meeting some months before we were retained on this project, there was a comment, that Mike may recall, which turned up in the minutes of the meeting. Somebody said, "Yes, the survey and questions were

strong on law. But those people never seemed to have gone back to the industry, to look at it from the industrial point of view, to configure these things as they are meaningful to the industry."

When we had an opportunity to re-survey a substantially larger sample, we decided to compensate for that deficiency. The questionnaire, therefore, went through a fair number of drafts and had a good many industrial inputs.

One result of that is that it is very difficult, therefore, to compare the National Science Foundation 1973 survey with the CONTU 1977 survey because the questions nave changed. What I will do in this brief presentation is to point out what findings are similar and what findings are different; and what has changed and see where we have come.

The report opens with a statistical caricature of the kind of company that is involved in this industry. In a sense this caricature is a function of the professional association that was being polled. If we had polled the manufacturers association, CBEMA, rather than the software association, ADAPSO, there would have been a skew of population towards larger firms, many of which are main frame manufacturers. They manufacture the CPU's, and create a fair amount of software for their own units.

There might, therefore, have been some difference not only in the industry caricature, but also in the survey results, which we will examine in a moment. Still, I think that the ADAPSO caricature is reasonably accurate for the vast majority of the industry as it is today. For example, it is still the case, that the computer software industry is especially attractive to small firms because it requires low capitalization to enter, there are a minimum number of restrictions, and for all the classical reasons that

research and development has been attractive to the small manufacturing firms, it continues to be so in computer software.

This kind of a project begins by asking questions. The survey instrument is in Appendix D of this report. Any ambiguity or vagueness that has been built into the instrument will plague the interpretation when one is trying to decipher what the answers mean.

This survey was sent to the professional association. In addition, an edited version of it ran in "Computerworld." You have the extract from the copy of "Computerworld" in Appendix C.

We had a very small response to the newspaper copy. The reason I brought the entire paper with me is that when you see something extracted on one page, it has a grandiose position. One wonders why the response is so small. But when you note that it was only one page in a newspaper of this size the small response is understandable. More interesting and important was the fact on that date the editors took the advantage of the occasion to write an editorial on copyright and software and CONTU. But they made no additional reference to the survey which was appearing that day. The editorial was called "What Do You Think?" I'm certain that it was picked up by your staff (as they seem to pick up everything else that goes on.)

The third input was from the manufacturers association, CBEMA. We had the assistance of Oliver Smoot of CBEMA, who sent out some of the questionnaires to his membership. There were a few returns also. Roughly speaking, between "Computerworld" and CBEMA we were dealing with under two dozen returns. What we did was to use the information anecdotally as a check against the ADAPSO information. It does not appear in any of the statistical tables that are cited

in the report. The cited statistics are only from the Association of Data Process Service Organizations. The response was very large. Normally, for a mailed questionnaire one expects a 15 to 20 percent response. We had a 38 percent response thanks to the encouragement we received from the officers of the association.

What did we learn from all this? In 1973 we reported that the industry did not appear to be a bit concerned about software protection as a matter of law. They had only some small concern about protection as a matter of fact.

In 1977 the situation has not changed. However, because the sample is larger, and because the questionnaire is more sophisticated, we now know not only the major findings but we also know where the law does make a difference.

This (referring to a stock of computer readouts) is really your report, but it's terribly difficult to read. These are the computer readouts of the study. They have been summarized by our statisticians. This, in turn, has been summarized by some 28 pages of analysis. That in turn, appears on a single "Summary" page; and hopefully I can say it all in one sentence to you:

"For the larger part this is an industry that is prepared to rely on technological resourcefulness and on fact arrangements to the extent that they believe that protection is necessary at all." Judge Fuld asked whether I was responsible for the phrase "of monumental insignificance" in the summary page. In reviewing this material and looking at the comments that made to the open questions, that was the inescapable conclusion at which I had to arrive.

In the first part of the report you will find a characterization
of what the typical firm is like. We asked "How many employees do you have?"
"What do you do?" How many programs do you have?" etc. then we summarized
the answers in a series of charts and graphs, in the beginning of the report.
I tried to sum up in a single paragraph: The typical company is independently
owned. It is less than 10 years old. It has fewer than 100 employees. It
has annual sales of under $5 million, and spends slightly under $100,000 per
year in research and development....I shan't read this to you. As you have
it before you, you know what I'm talking about.

We know what they are. What did they say? I think that the key
exhibit is No. 14.

COMMISSIONER LACY: Which is on what page?

MR. MILLER: Page 19. Exhibit No. 14 on page 19 has two scales.
The scale on the right frequency of use is a scale that pertains to the
entire sample. It tells you, for example, that 21 percent, of the entire
sample said that when they used protection techniques, they used trade
secret. Twenty percent said copyright; and a tenth of one percent said
that they used patent.

The scale changes as you look to the left of the double line. The
scale to the left of the double talks about how protection is perceived by
whatever percentage it was that used it. Thus, for example, if we look to
the first line, where it speaks of "82 percent not at all affected by patent,"
that means that 82 percent of the four-tenths of a percent that use patents
said it doesn't work well at all.

There have been brilliant legal arguments published on the desirability of each mode of protection. The most recent one to come to my attention was received last night from Roy Freed. Some of you may have picked up a shortened version of this printed on page 27 of "Datamation."

The title is, "It is Unwise to Copyright Programs." Roy explains the rationale behind the preferred use of trade secret, and why it should be preferred. It is a rationale for why the industry does what it does, why it makes sense and why he, as an attorney, would advise his client against the use of copyright.

MR. KEPLINGER: If I might interject, this brief document is a summary of a letter from Roy Freed that was previously distributed to the Commission as one of the submitted comments on software.

MR. MILLER: That's right. I asked Roy whether I might refer to it and whether the Committee had already seen it. He said the Commission should be reasonably familiar with his views by now.

What we learn from this exhibit is that copyright protection is reasonably popular, and is regarded as reasonably effective. Although 55 percent of those who use copyright say that it's "not at all effective," if you look to the middle grouping of "somewhat" and "fairly" effective you find that many people think it is pretty good. Approximately 30 percent state it is first rate as a mode of protection.

How do we account for this? In 1973 copyright ranked third in the preferred modes of protection. However, the ratio of respondents to the National Science Foundation survey who reported using copyright protection compared to the ratio in the CONTU survey was almost ten to one. Proportionately, more

people used it in the NSF survey than in the CONTU survey. The absolute numbers vastly increased by 1977.

We are uncertain about why this is so. It could have been a function of the product line represented by the respective surveys. Although the same group was polled, it was a very small organization at that time, (40 some-odd companies compared to well over 308 at the time of the current survey.)

COMMISSIONER NIMMER: Do your findings indicate why those who say copyright is a good form of protection say it is good and why those who say it is a bad form say it is a bad form? In other words, I'm wondering to what extent it is an actual experience in litigation, to what extent it's a matter of not being enforcible, or just an instinctive reaction.

MR. MILLER: It is an instinctive reaction to whether they feel there has been plagiarization. The amount of litigation is extremely small. We checked that out. Only about six or seven firms had litigation experience; two or three of these were in copyright. They downgraded copyright as a result.

We correlated those who had litigation experience with copyright protection. It is a small number. Basically, they were not impressed with the scope of protection. My feeling on reading their comments was that as copyright usage has increased, more respondents have used a relatively accessible, inexpensive mechanism to try to protect more programs that cannot be protected by copyright. Those programs which can be effectively protected by copyright deal with general business programs or systems programs that tend to be universal.

The general business program is not easy to use if substantial changes are made. Then, it is not really copying. To use another's business program, it is necessary to plagiarize it. Copyright becomes useful then. The same is

true for systems software when one is concerned with the programs that help to make the unit operate.

Those who felt that copyright was useful, and used it, were firms involved in general programs. Exhibit 15 suggests that the more technologically complicated a computer program is, the less significant is protection of any sort and copyright is the least significant of all. The converse is also true.

If we look at the top line of Exhibit 15 "general business and financial applications" show no significance for 17 percent and great significance for 50 percent. Down at the bottom 43 percent of the "systems software" column say it's of great significance. Combine the "great significance" and "some significance" checkoffs and you get some pretty substantial numbers for those two categories. However, when you are talking about complex production, scientific data and so on, they do not appear to be significant.

So we broke those entries down further: We took the two columns that said "some significance" and "great significance" and the column that said "no significance," combined the first two into one, and correlated these findings with the two areas, "general business" and "systems software," where response was high, to see who it made a difference to and why.

The results are in the front of the report: We found those who said that copyright was important generally tended to be companies with higher costs of development - 49 percent "less than $50,000," 58 percent "between $100,000 and $300,000"...and then it drops off.

The reason for the drop-off is that there were very few firms in the latter categories. If I were to extrapolate beyond the data base the curve would be an inclined positive slope.

COMMISSIONER WEDGEWORTH: Mr. Miller, could I interrupt for just a second because there is something that you said I don't completely understand. It sounded as if you were suggesting that the reason that there is less confidence in copyright protection for certain categories of programs was because they were technologically complex?

MR. MILLER: That's right.

COMMISSIONER WEDGEWORTH: Which puzzles me --

MR. MILLER: Not merely the complexity, Mr. Wedgeworth, but the fact that it's a close fit to its use.

COMMISSIONER WEDGEWORTH: Yes, more unique.

MR. MILLER: "More unique," that's a better phrase. It's uniqueness.

COMMISSIONER WEDGEWORTH: It's confirmed by the correlation you did on page 23 because it seems to me the more marketability the program has, which means the less unique it is, the more likely, as you have said in your summary, that the proprietors are likely to be interested in copyright protection.

The more it is fitted to, say, one application or a very small series of applications, then the less interest there will be in copyright protection because use would be a factor and the use is quite limited.

MR. MILLER: One cannot equate "uniqueness" with "complexity," and I tended to err in my presentation.

COMMISSIONER WEDGEWORTH: Thank you. I just wanted to be sure.

MR. MILLER: Again, with respect to sales, the larger the company becomes and the more generalized and less unique its software the more important any protection becomes to them.

We are not in a good position to make the judgmental inferences from the survey. They would be different, in patent and copyright. In the case of patents I would be disinclined to draw the same conclusions about the significance of small numbers that I might in the case of copyright. For example, in the case of a small number of inventions in the energy field, one may be dealing with key inventions whose suppression could be a barrier to the energy program. This situation is not common to copyright, or to computer software protected by copyright. Therefore we have limited ourselves to conclusions of fact.

The phrase on page 27, "There is no question that development programs have been occasionally abandoned" cites the exception. Our general finding is that they are not. We also find that marketing rarely changes, because of the existence of software protection, nor the respondents change much of their marketing even if you were to change the law. They do not look to the law.

We found that even when we broadened the question on the survey beyond legal protection to protection in general, 70 percent of the sample knew of no instance in which there was either an aborted marketing scheme or the development of software because of the lack of protection. Only three percent responded in the affirmative.

Yet, we do know that there have been some abandonments. For example, one small company with annual sales of $140,000, stated that it had abandoned development of system implementation language and would resume development if it could be protected. A second company with annual sales of $400 million stated bluntly that it abstains from developing applications packages which can be used with the hardware of other companies because it lacks protection.

This is the kind of live testimony you have had before you. As we noted in the summation, those who are impressed with the importance of protection

and the importance of copyright will appear before you. The question to which we addressed ourselves is how typical is such testimony of an entire industry. It is not. Whether witness testimony has policy implications beyond the numbers they represent was simply beyond the scope of the study.

As a lawyer, interested in the field, I am disappointed at the lack of industry interest. I would like to play around with different modes of protection. For example, the application of the European utility model fascinates me in this respect. It is an exciting intellectual field to those of us here today. Those who make their livelihood out of software are obviously less excited than we are. That really is my conclusion. I stand ready for your questions.

COMMISSIONER NIMMER: With respect to your Exhibit 14 and these various modes of protection and preferences, this is related to my earlier question, but I'm wondering whether this really tells you very much.

I could understand if in a given answer the answerer had employed all or a number of these types of protection and had found some wanting and others effective, this would be a meaningful reply. But I suspect the fact is that either they used all or some of these forms, but the answer that one is effective and another is ineffective simply reflects the fact that if they feel there has been no copying, then the one they use is effective and the ones they don't use are not effective; or if they have had copying, then the ones they used are not effective and the ones they don't use are. This is a guess.

MR. MILLER: There is no question there is an "elephant on the lawn logic" in this. You are all familiar, I imagine, with that logical paradigm in which a man is watering his lawn in the winter. When asked why he continues to water his lawn, he says, "It keeps the elephants away." His neighbor,

astonished, said, "What do you mean?" And he said, "You haven't seen any elephants around here all winter!" That is the point. I imagine that since the respondents were businessmen that they took a personal view and say, "If people are copying, the law doesn't work." I think there is something to it.

COMMISSIONER CARY: Mr. Miller, somewhere in your report I seem to recall a statement here that only one percent of your replies came from lawyers. Am I correct?

MR. MILLER: That's correct, sir. Which is why I was amazed that there was such a high response to an open question about the utility of copyright. I would have expected a larger number of them to say, "I don't know."

COMMISSIONER CARY: This was exactly my question. Do you have any reason to give us, do you have any facts?

MR. MILLER: They are a very immodest group; that's all I can tell you. When we got this high response, I went back to see how many of the respondents were in a position to really answer a question like that. We deliberately reserved categories for "don't know" as well as blanks and no answers. We encouraged respondents who didn't know an answer to say they didn't know. No, sir, I cannot explain it.

COMMISSIONER CARY: Well, on the last page on your report there appears a statement that this comment most often repeated was an apparent lack of interest in legal protection was related to the fact that they did not maket proprietary software. Do you mean by proprietary software material which they produced on their own initiative as a result of some contract or something or where they are just duplicating standard type of software, is that what you mean by proprietary?

MR. MILLER: Remember, we are dealing now with a small number of responses. The question to which that response was made was, "Please provide any additional information or comments that you think would be helpful to CONTU in its study." This was the open final question.

Thirteen percent remarked that "we are not really very concerned about legal protection because we do not sell proprietary software." Now, that can still mean that they use it. So, for example, those who replied to the "Computerworld" survey would be classic of those who buy and use it, but they are not in the business of selling it to others.

COMMISSIONER WEDGEWORTH: Or they are producing it under contract for some specific application for somebody else.

MR. MILLER: Yes, precisely. A company has been retained to do something for the Air Force or for the Department of Transportation; it designs the software, delivers the software, and says, "I'm not in the business of making proprietary software. If I were making a product that I sell to the general public, then I would have more of an interest in protection."

COMMISSIONER LACY: I have two or three reasons which, if taken into account might help to lessen our surprise at the results of your questionnaire. Obviously the '73 respondents and I suspect the '77 respondents had in mind the situation as it has existed hitherto under the 1909 law, in which if one wished to obtain federal copyright protection for a program he had to take certain affirmative action, which included publishing it, depositing it in the Library of Congress, and making it generally available, which might substantially reduce the protection available to him through trade secret or eliminate it from him.

They are probably not that clear about what I take it will be
the law after '78: that willy nilly they are going to have copyright protection
whether they want it or seek it simply by creating the program. Their think-
ing might be affected by that. There is no necessity of publication or
deposit in order to get federal statutory copyright, but they might retain it
if they publish it.

The second point is, I think if we look at more conventional media,
your firm, for example, or any one of the dozens of other management firms
that do expensive custom-made reports for individual customers, are quite
unconcerned about copyright because you are getting a sufficient payment for
the work from the original customer and it's unique to his interests and
is not likely to be very interesting to other people. If it is one that
is of interest to a dozen or two people and you get a consortium of sub-
scribers who put in $10,000 apiece, you may be very much concerned that it
stays within that consortium, but you rely on their maintaining its confi-
dentiality out of their own self-interest. Again you never think of copy-
righting it in the traditional sense by putting it in the Library of Congress.

That, essentially, is the kind of business most software firms have
been in hitherto, just as an artist commissioned to paint a portrait of the indi-
vidual is quite unconcerned about the copyrightability of works of art. That's
probably what most artists of that type do: for the type of artist producing
Currier & Ives type prints, copyright becomes quite crucial.

Now, if one assumes up to the present time the market for computer soft-
ware has been relatively small numerically, not an enormous universe of firms
or individuals have had computers and generally when they have had them, they put

them to specialized uses requiring rather specialized applications programs. The testimony we heard yesterday would certainly suggest that within a decade or two enormous numbers of not only firms, but individuals, would be having programmable microcomputer operations, and one would shift from a bespoke type of program production under contract or intended for sale to a small group to programs that would be sold, programs that didn't require constant maintenance and personal followup. It might be sold quite inexpensively in a chip or similar format to large numbers of customers. There you would be getting into a business that's quite analogous to publishing in the traditional sense where a copyright would have a kind of meaning it. wouldn't have for the management consultant firm doing a specialized program.

That is, it doesn't necessarily relate to the distinction between programs and text so much as it does to the stage of the business of whether the program or the written text is being produced for a uniqueness of an individual customer or small group of customers or whether it's being genuinely published for all who wish it to buy.

So I really think that we may be reflecting both an early stage of the industry and an outmoded state of the law in many of the conclusions. What we really need to look for is not what the law was, but what it should be for an industry as it may develop in the remainder of the century.

JUDGE FULD: May I ask one question. Your survey didn't include questions as to whether anybody objects to copyright or objects to trade secret. It didn't cover that aspect, did it, whether there was objection voiced to a particular method of protection?

MR. MILLER: I'm not sure I understand the thrust of your question, Judge Fuld.

JUDGE FULD: Would anybody object to having it protected by copyright so far as your survey goes?

MR. MILLER: I think that if a person objected, he would simply not use it. No one compels anyone to use any form of protection. And consequently, the availability of any law is scarcely objectionable if its use is strictly optional. You just ignore it.

I understand the thrust with respect to the copyright law of '76, of course, where publication is deferred. This comes to the observation that Professor Nimmer made. One of the questions asked "Do you contemplate any change in your marketing program because of the Copyright Act of 1976 effective January 1, 1978?" We were trying to solicit a response to your question.

I would have expected a large number to say "I don't know." What we got was three percent said "yes," 76 percent said "no," the "don't knows" were three percent, the "not applicables" were five, and the "no answers" were one.

COMMISSIONER DIX: Mr. Miller, if I had a conspiratorial view of life and discovered a situation in which a few large producers of something wanted protection, and a larger number of smaller producers said we don't want protection, I would begin to think that maybe the smaller people were getting something from the large people that they didn't want cut off.

Is there any conceivable evidence that there is a kind of fall-out of useful material that the smaller people are using?

MR. MILLER: None whatever. They are in different markets.

COMMISSIONER DIX: It just occurred to me as a general proposition in life. (Laughter) I give you a parallel the reason I thought of it, I'm a librarian and in the library world there are the haves and the have nots. The people who lend a great deal more than they borrow take a different

view of inter-library loan from those who borrow a great deal more than they lend in terms of protection.

COMMISSIONER HERSEY: It might be something different, I wonder if there are other significances in the fact the CBEMA cluster had been pushing for copyright for their colleagues and the ADAPSO group seemed not interested in it. Are there significances in this?

MR. MILLER: Yes. CBEMA consists of firms that manufacture computer hardware. Computer software is ancillary to them; systems software is necessary for the operation of their equipment. Note that of the two groups that thought it was most important, one of them was the system software group. It is the question of uniqueness again. They do not want other people taking the programs for their machines.

COMMISSIONER HERSEY: Systems software, I would add as a footnote to the Commission, is of the kind that operates machines and is most mechanical, I think the mechanical end of the spectrum that I have talked about.

MR. MILLER: We have used a little explanatory phrase for applications software and systems software, (although I would imagine you have heard all of this so many times in the Commission you are quite familiar with it.)

COMMISSIONER WEDGEWORTH: I'd like to follow up a bit on the line of thought that Mr. Lacy started, namely the change in the law and that perhaps the survey reflects perhaps more the stage of development of the computer software industry than anything else.

I think that there may be some parallels even in the more traditional print applications of the copyright law. I note that during the long discussions concerning the development of a new copyright law a group of

authors that tend to represent the academic and scholarly world were much less prominently represented and had fewer opinions on the copyright law than other types of authors and publishers.

I'm not so sure that we aren't seeing the same thing here. What I really would like to hear you comment upon, above and beyond your survey, is your general view of how you see software developing. Do you see a dramatic escalation in the next decade of the number of general type software programs as distinct from the special use applications programs? Because that may be somewhat of an index to the increasing awareness of what copyright protection may do for them.

I certainly noted the increase in use from the '73 NSF survey to the one that you have here.

MR. MILLER: Personally, I believe that, as computers fall into more general public use as opposed to specific business and commercial use, you are going to see a large development of a firmware market. I do not believe that the public user is going to be either purchasing or creating any significant amounts of software. I think he is going to want to buy interchangeable firmware such as chips or tapes. The user knows what it is he wants to do and, like the purchase of a patent medicine or remedy from the store, will simply buy the package program.

COMMISSIONER WEDGEWORTH: Like Radio Shack?

MR. MILLER: Yes. It's like the purchase of a recipe. Now, this is the way I would see the development in the future, which brings us back to your question of matters appropriate for copyright and matters which are not.

COMMISSIONER LACY: Like a phonograph record rather than the score, because the longer plays music on the piano.

MR. MILLER: Sure.

MR. KEPLINGER: Mr. Miller, if I may ask one question along the same general lines. My examination of the statistics and the characteristics about the type of firm that responded to the questionnaire and your own admission of the anecdotal response indicate that a significant number of the firms are not the kind that market proprietary software.

Would the statistics regarding usage of the various protective modes change significantly if that portion of the sample were excluded?

MR. MILLER: I don't accept the premise. About 13 percent in the open question said that they wouldn't be of more help to CONTU. I think this is the largest group of proprietary software marketers in the country.

MR. KEPLINGER: Yes, I understand that. But ADAPSO by its nature includes computer service organizations that operate service bureaus that are not in the proprietary software business and a certain percentage have responded in the sample came from that group, presumably the 13 percent.

My question is, if you exclude that 13 percent from the sample from the analysis, would that change the ratios of the perceptions of the effectiveness of the modes of protection and the percentages of individuals who used those protective methods in any significant way?

MR. MILLER: If you exclude them, I would have to say the survey is only two-thirds accurate. How else can I answer that? You've asked me to try to establish a fact basis and then you asked me what the possible consequence would be of excluding 13 percent of the sample.

MR. KEPLINGER: Presumably because that 13 percent of the sample has no interest in the proprietary protection methods which are employed. I don't know if that could be done using the data and if it were done, would it change the figures in the last column of Table 14 or would it just simply increase them all by a third?

MR. MILLER: To be honest, I think that the latter would be the response. I don't think it would change the proportions appreciably, but that's judgmental and I can't derive that by making a snap calculation.

COMMISSIONER WEDGEWORTH: Just one other brief question, Mr. Miller. Is there any significant movement in the software industry to begin to create more generalized firms or mergers -- from scratch or mergers -- that might produce multiple interest firms?

MR. MILLER: I'd say the contrary is true.

COMMISSIONER WEDGEWORTH: They are becoming more specialized?

MR. MILLER: Yes. There's more money in it. Every firm is trying to stake out areas of uniqueness and become known as the micro-minicomputer firm, or as the leading transportation firm. They want to become distinguished.

I'm not in a position to answer about acquisition and merger. I don't believe there has been a great deal. Some firms have grown very large. But such mergers as there have been have been offset by the burgeoning of new ones. The number of responses from extremely new small outfits all over the country, was astonishing.

The low capital cost of entry makes this a very attractive field for a company that detects a gap. They fill the gap and market their uniqueness with respect to it: "Oh, you are with the Department of Transportation?

Yes, but the real problem we see now is highway safety. You certainly don't want to use an outfit that specializes in aircraft. Different fields." Both are transportation but specialized programs capture new markets.

MR. KEPLINGER: If I may ask a question: if one believes the statistics published by other fact gathering organizations that deal with statistics about computer software and its usage, they indicate that the generalized software package planning is the most rapidly growing segment of the software area, and it's likely to increase in the future.

I think what you are talking about is specialization within an application area, not specialization to a particular computer system necessarily.

MR. MILLER: Right.

MR. KEPLINGER: But an attempt to market a generalized computer package that will serve the needs of all aircraft traffic control centers in the country regardless of the kind of computer system they use?

MR. MILLER: Yes.

COMMISSIONER WEDGEWORTH: Thank you, Mike, that's what I was trying to say.

MR. KEPLINGER: Or in general point of sale marketing technology or something that has wide general applicability within an application area.

COMMISSIONER DIX: The implication of that being there may be more people coming now who want protection?

MR. MILLER: Both. If the question I was addressing myself to is "What was happening in the industry?" I would completely agree with what Mike said. It is totally valid.

COMMISSIONER HERSEY: It's important to add to that that the tendency is also to firmware.

MR. MILLER: No, that was a guess on my part. I was asked to conjecture which way I thought the industry would develop. This is my own feeling and I think the committee should invite testimony from those who are more informed on industry movements than myself on that question.

Mr. Lacy, I believe, asked the penetrating question that goes to the validity of this survey. This survey was done in 1977, the other one in 1973. He said when people answer questionnaires like this are they looking backwards at the existing technologies. Should this Commission be looking backwards or should it be looking ahead to the growing technology? To what degree would it be appropriate to extrapolate existing markets? To what degree should the Commission assume the areas of greatest growth are apt to be in general business and systems software, the areas that indicate the greatest interest in protection, (notwithstanding the fact that they were a smaller voice in the overall population)?

If you say that smaller number is the direction of the future, then the Commission indeed must pay more attention to it than the survey would suggest by looking at the existing markets.

JUDGE FULD: Are there any other questions?

MR. DAVID PEYTON: Two statistical questions, Mr. Miller. One may be simply a typographical error, I'm not sure. With regard to Exhibit 14 again, I gather that the final column expressed percentages of the entire sample so that, for example, four percent of the entire sample said they had used patent protection?

MR. MILLER: Right.

MR. PEYTON: And that the .82 and .18 mean that 82 percent of the
four percent said that patent was not effective and that the 18 percent of
the four percent said that it was?

MR. MILLER: That's correct.

MR. PEYTON: Okay. So that the adding then is across and should add
up to 1.00. In the second column, copyright, the sum is considerably over 1.00,
.55 and .65, and it would appear that there is perhaps a typographical error
there, unless there's an overlap of answers.

MR. MILLER: There is. I'm looking at the original. This is very bad
and I thank you for bringing it to my attention. That ".65" should read ".05."

MR. PEYTON: Not two-thirds thought copyright was somewhat effective,
but only five percent thought it was somewhat effective of those who tried copy-
right?

MR. MILLER: Yes. I'm to blame for this. We had a time squeeze and
I withdrew the manuscript from the proofreaders, which is a bad thing to do. This
is why this is only a private release to CONTU. Indeed, in here my good friend
Bob Bigelow has pointed up some small errors in the citations, which we will cor-
rect as well.

MR. PEYTON: The other question regarded the difference in responses
between general business programs and systems software and by inspection it so
does appear, as you have indicated, that the concern with protection of general
business software is rather uniformly greater than with systems software.

I wonder if it would be possible for you to go back to your original
data and run a confidence interval test so that we could see at a 90 percent

level of confidence or 95 percent level of confidence, whatever, that these results are truly reflective of different levels of concern and did not arise just by chance because of the size of the sample or the composition of the sample.

In other words, if this difference is one that really is one of some importance, then I think that statistical test should be run, so that it's not just one inspection, we are looking at in numbers, but a more systematic way.

MR. MILLER: It may be. I would like to respond to this by saying that afterward we will go over the figures together and see whether it pays to do so, okay?

MR. PEYTON: Yes.

JUDGE FULD: Are there any other questions? If not, thanks very much, Mr. Miller, for being here.

Arthur will address us briefly.

MR. ARTHUR LEVINE: It's really not address. We are scheduled to meet December 15th and 16th. Unless there is some urgency on the part of the Commission to meet those days, I would suggest that we not meet in December and hold our next meeting in January.

The Photocopying Subcommittee's activities may be a factor here, however, as to whether we want to meet. Perhaps the Photocopy Subcommittee alone could meet.

COMMISSIONER NIMMER: Depending how the meeting goes today, we may not meet in December, but it's possible.

MR. LEVINE: Could we hold open the possibility we may not have a meeting in December and after today's meeting with the Photocopy Subcommittee I'll let

everybody know if the meeting would be held. I think New York would be about as convenient as anywhere.

COMMISSIONER WEDGEWORTH: I'm not sure I understood the contingency, Arthur. Are you saying that the full Commission might need to meet based upon what happens this afternoon with the Photocopy Subcommittee?

MR. LEVINE: Possibly.

COMMISSIONER NIMMER: That's one alternative. Another is the Photocopy Subcommittee may have to meet, and the third alternative is we may not meet at all.

COMMISSIONER WEDGEWORTH: That's why I raise the question, it may simplify it for our colleagues. It is my understanding we thought we were going to be shooting toward presenting a report of the Photocopy Subcommittee to the full Commission at the January meeting. And unless there is some other business, I would say that we could probably decide whether or not the full Commission would meet in December before we leave here.

COMMISSIONER LACY: Mr. Chairman, it seems to me there may be two reasons for disposing of the December meeting. One is that it's inconvenient, certainly it would be for me, to meet on those dates, as crowded a month as December is with the holidays later.

But putting aside that and assuming there were no special December problems, it does seem to me that the burden of work lies on the Commission at this time, that we ought to plan before we decide on a December meeting. We ought to plan something about the remaining schedule of work.

It does seem to me that the burden rests at the moment on the Subcommittees. I frankly see little reason for another Commission meeting to hear general testimony until the Commission can meet and act on Subcommittee reports.

The Photocopy Subcommittee has yet to prepare a report. I suspect that the other two Subcommittees on Software and on Data Bases may want to reconsider their earlier reports, certainly the one on data bases would want to reflect in light of the subsequent testimony we have heard.

And it seems to me what we ought to be looking to in December is whatever action is necessary for all of the Subcommittees perhaps to have amended reports ready for the next meeting of the full Commission with, I hope, staff prepared draft strategy language to implement the conclusions, or the various alternative conclusions, that the Subcommittee is going to present to the full Commission.

I'm all for dropping the full Commission meeting in December, but I wonder if we shouldn't be thinking of Subcommittee meetings between now and January to do some serious work on Subcommittee reports.

JUDGE FULD: I would favor that, too. I'd like to rethink the Subcommittee on programs. I think that would be better to wait until January, to have the committees act in the meantime, get together.

COMMISSIONER LACY: My point was not to let December lie fallow.

JUDGE FULD: No, committees will get together. Does anybody else have a different view? Unless some emergency occurs that calls for a December meeting, I think we might put it off to January.

MR. LEVINE: Fine. We will be in touch with the chairmen and members of the various subcommittees to set up meetings of the subcommittees. I'd like to just block out the dates of January 12th and 13th. I would suggest the following dates for Commission meetings: February 16th and 17th.

JUDGE FULD: January 12th and 13th?

MR. LEVINE: 12th and 13th are the January days.

JUDGE FULD: California.

MR. LEVINE: February 16th and 17th; March 16th and 17th; April 20th and 21st; May 18th and 19th.

JUDGE FULD: Nothing in August?   (Laughter)

MR. LEVINE: If we meet in August, we are in trouble.   (Laughter)

COMMISSIONER WEDGEWORTH: What was the May date?

MR. LEVINE: May 18th and 19th.   It will have to be done by telephone hookups since I think our funding will cease or will have ceased.

JUDGE FULD: Maybe collect.   (Laughter)

COMMISSIONER WEDGEWORTH: Our meeting on January 12th and 13th is important if our Subcommittee on Photocopying comes up with a report.   I'm concerned about meeting in a place that will be convenient for those individuals and organizations who have been most concerned about our work.

COMMISSIONER NIMMER: Bob, their reaction which, of course, will be significant, would in any event come after the meeting.   We will be for the first time making public what our position is.

COMMISSIONER WEDGEWORTH: That's true.   But I thought I would raise that as an issue.   I think definitely we ought to have a meeting again in that part of the country, but I was just questioning whether there would be any point in reconsidering that particular meeting.

COMMISSIONER LACY: If the Committee on Photocopying has a report and has submitted it to the full Commission in January and the full Commission without acting on it finally has indicated that it is ready for revelation and comment, we might want to distribute it widely to the special interest groups

and perhaps not tie up the full meeting of the Commission, but have the Subcommittee hold a hearing in New York or Chicago for comment on that specific report.

I think that might be a procedure by other committees, too. Not necessarily because I suspect the report is going to have anything dramatic or revelationary in it, but people would like to think about it and consult their colleagues before they respond.

JUDGE FULD: Apparently we will tentatively meet in Los Angeles.

MR. LEVINE: The Photocopy Subcommittee is planning a meeting at the conclusion of the Commission meeting and I think we will just remain in this room and break for lunch if necessary and continue until such time as airline schedules require that we end.

JUDGE FULD: Do any of the Commissioners want to talk to any other subjects while we are here?

COMMISSIONER HERSEY: I would like to say a few words because I'm on the Photocopying Subcommittee but have some views on the Software Subcommittee's efforts. I know it came very late in the day yesterday after a long day and we were probably tired, but the last two statements by Weizenbaum and Licklider were to my ears unequivocal statements that copyright would not be appropriate protection for programs and I found it a little surprising this morning that after this fresh air had blown through yesterday on that point and many others we seem to be proceeding with questioning as if yesterday hadn't happened.

JUDGE FULD: I did say I'd like to give further thought to it.

COMMISSIONER HERSEY: I understand that. What I wanted to say is that fresh air, some fresh air certainly blew through my mind yesterday and I had been thinking and studying on this subject all along, too, and I think that I would like to make the matter of record that my own position is moving somewhat.

I can't say that I am altogether ready to move off what Arthur Miller with his characteristic grace called that old special legislation shtick. (Laughter) But I think I'm moving toward the notion that my additional views would not include the recommendation of the sort of special legislation that I had included with the additional views before.

And my present motion is toward the sense that the appropriate protection for software would be a combination of a number of modes of protection, including contract law, trade secrecy, a special legislation in the area of crime, concretely the Ribicoff bill which has been circulated to this Committee but hasn't had very much attention from this Commission; and possibly some other existing modes of protection, concretely the one that the two yesterday particularly emphasized, which is technological protection, and that copyright, it would still be my view that copyright would not be an appropriate form of protection, rather this other complex of existing modes.

I just wanted to put that in the stream of discussion. I'm sorry that two-thirds of the software committee was not present when these presentations were made yesterday afternoon and are not present here today.

JUDGE FULD: I will convey that to them.

COMMISSIONER WEDGEWORTH: In view of those comments, I don't know if there was ever any staff comment on the Ribicoff bill as implications for CONTU work, was there?

COMMISSIONER HERSEY: It was one page.

COMMISSIONER WEDGEWORTH: I don't recall, I guess I'll have to review that. But I think it might be well just to look at that, John, if we were to ask the staff to pull together the several elements that you mentioned in terms of how the parts might fit together and what precedent there might be for some kind of legislation that would combine several traditional areas of law.

I don't know and I think that it would be helpful if we could get the staff to give us a little lead to see whether there is enough merit in that approach to make it worthwhile pursuing it just beyond general discussion.

COMMISSIONER HERSEY: I have already taken the liberty of starting that process a little bit in the staff because of my interest and asked that some thought be put on this. And I think we have some indications from Ribicoff's legislative assistants that they would be interested in our comment on the law as it's now being drafted and it's possible that it might be amended to meet the need more fully than it presently does. I'm not sure about that, that's a very tentative kind of notion.

COMMISSIONER WEDGEWORTH: I still have serious reservations about that approach, but in terms of looking at the area, I'd like to have more confidence that we have looked at alternatives other than our present discussions would appear to show.

JUDGE FULD: Anything else, John?

COMMISSIONER HERSEY: That's all.

JUDGE FULD: Anything else that anyone wants to say?

COMMISSIONER LACY: Mr. Chairman, there is one sort of, philosophical is not the word I want, but in thinking about the discussions yesterday, it occurred

to me that there is one perhaps overarching sort of consideration that runs

through both the data base and the photocopying committee's concerns, and it's

sort of simple-minded idea that doubtless has occurred to everybody else but

me, I actually hadn't really thought about it much until yesterday.

It occurrs to me there might be sort of a pattern to our thinking and

I want to toss it around the table. Most of our traditional modes of distribut-

ing knowledge have worked on the basis of achieving economy distributing a

product to a very large number of people. And where the product isn't a compila-

tion like a dictionary or reference work or a newspaper or, for that matter, even

a journal, we have recognized that the majority of the content is of little or

no interest to the majority of the recipients.

The reason that one gets to follow up on the example of yesterday showing

enormous mass of data in the "New York Times" for 20 cents is that he buys about

98 percent of it in which he has no interest at all, but the 20 cent price is so

low what he wants out of it is still a bargain at 20 cents.

When one buys an unabridged dictionary for $50 or so, probably in his

lifetime of use of it he would look up what, one-hundredth of one percent of the

words in the dictionary, but it's still a good buy for that reason. When he

subscribes to a journal, most of the statistics have indicated that the average

reader may read only what, 10 percent of the articles in the journal and indeed

all the subscribers taken together may read, only a few dozen of them may read

a particular article.

We have economized by a massive distribution to a larger number of

people a large array of information, the bulk of it not for everyone. New

technologies, both computer readable data bases and photocopying, have tended

to provide an alternative which at a much higher unit cost one gets only what he wants.

The image would be, and obviously this is an impractical, economically unrealistic dictionary, would be indeed of providing everybody with an unabridged dictionary, there was one master unabridged dictionary with on-line access to the overall country and one never got out of the dictionary anything but the one word he might want, and that might cost him 25 cents for each time, but still it would be cheaper than paying $50 for the package.

More realistic, it is the massive catalogue books, like the National Union Catalogue, which have been available, reproduced in hundreds of printed copies, in fact no one user will use more than a thousandth of one percent of the contents of the catalogue and any one institution may use only a hundredth of one percent. You substitute for that one copy with access to your specific needs.

Now, that's running through all of our sorts of things and we have the two school phenomenon, it may be that for many types of things the central resource with on-line access on it for individual data is the most efficient system and simply replace the other systems. But probably for most cases one will run parallel situation in which one both makes available the entire body of material for a large number of people, but this custom-made resource uses part of it.

And the question is in part how does one determine the truly efficient array and to do that one really needs, of course, to load part of the first cost on the specialized use of the thing. Now, this even relates to libraries themselves. If you view the library as a whole as the data base, some recent studies come out of Pittsburgh having suggested, I believe, in them that almost half,

46 percent, as I recall, of the books acquired by some classes of libraries were never used by anybody and the overwhelming majority were only very rarely used. If one thinks of the library as a data base, one moves back ultimately to the British Lending Library where there is a central resource and one doesn't acquire a whole library, one acquires the opportunity to pick up a thing.

I just toss this as a consequence of the technology of the 19th and early 20th Century all lent the self-running from high speed printing up to broadcasting to techniques that made dissemination of communication very cheap by disseminating it to very large numbers of people on a highly undifferentiated basis, TV for example being fantastically cheap, tens of millions of people getting things cheap.

You have a swing of the pendulum with computers and photocopying and not within our jurisdiction, but cable and pay television, which enables a higher degree of selectivity of only what one wants out of this mass, and our question is to some extent how can that be so dealt with in the legal framework to encourage this efficient use and to encourage this protection of the total mass upon which the data base is on.

I simply throw that out as a mode that runs through all of these things and perhaps might be an overall theme of the report as a whole.

COMMISSIONER WEDGEWORTH: I'd like to just respond briefly to that because it hits on a parallel line of thought that I had in terms of some of the activities that have gone through. Dan focused on the capability now of specific tailoring of information, product to information needs. But I would emphasize the part that you just touched briefly on, the need to continue to make it easy to access broad generalized portions of that information resource,

because what tends to happen is that even though we can be seduced by the idea of having this centralized system that will do all of these things for us, in actual experience what we discovered is it doesn't work very well.

COMMISSIONER LACY: You know my own personal feelings on that, Bob.

COMMISSIONER WEDGEWORTH: Yes. And I was very much impressed by some recent information released in the Library of Congress information bulletin where they were doing a study of their not on shelf problem and they were pointing up, they gave an example of a person who came in and asked for, I think, about 26 separate volumes in one day and it took about eight hours to get the final response, which turned out to be that they didn't have that particular item, but that the man was able to locate a very high percentage of those same items, I think, at the Fort Wayne Public Library.

And the whole point of my raising this is that I think the Commission is going to have to have a view to the new technology using telecommunications jargon to the narrow band as well as the broad band. Because we have known the broad band type of activity through journals and easily accessible kinds of information products that reach a large generalized audience; and now we are seeing that we not only have the technological capability of breaking that down and serving more specialized needs, but there is really an economic incentive to do so.

On the other hand, if we go too far in that direction, I think we ignore the needs of a broad spectrum of users who need access to larger percentages of the information product that are available, perhaps packaged in a way that make them continually attractive economically as well as intellectually.

COMMISSIONER LACY: I agree completely. I was thinking every one of the things we take up somehow has a relationship to how on the spectrum you balance a set of interests. This is a common theme that runs through data bases, telecommunications, facsimile transmission.

COMMISSIONER WEDGEWORTH: Exactly. I want to give one other specific example I hope we would pay attention to. We have had a lot of general discussion about off the air taping and of what happens with right of access and what kind of protection is available for broad band kind of telecommunication kind of information sources.

What concerns me more is that everybody seems to be terribly concerned about television and things like this, but very few people seem to be concerned about the non-broadcast technologies which will continue to serve certain specialized needs, what can you do when you get a videotape of something from a commercial source and I think the Commission needs to bear those interests in mind as well as the broader more popular interests in the new technology.

COMMISSIONER HERSEY: Speaking to the philosophical questions that Dan has raised, I think one other thing we have to bear in mind is the need for protection for diversity. The super on-line dictionary chills me. Is it the OED or is it Funk & Wagnall's College Dictionary? How is gallop spelled. (Laughter) The need for various ways of thinking and seeing is terribly important and the lay may be a way of protecting or encroaching on that diversity.

COMMISSIONER LACY: This is a very real question, John, even if you got to wait for more philosophical questions, to the extent you thrust, Bob and Alice know more about it, thrust toward central bibliographical sources, you get a thrust toward the need of bibliographical description, you got to have one

because there's going to be one great big card catalogue in the sky from which every document is recorded and it all has to be recorded in the same way and this is quite inconsistent with specialized cataloguing needs of many institutions. It's a very nuts and bolts as well as philosophical question.

COMMISSIONER WEDGEWORTH: Also it tends to ignore the more practical problems you can get just by looking at the implications of queuing theory. You can have the marvelous theory, but you can only serve so many people at a given time.

JUDGE FULD: This has all been very helpful to a narrow generalist. (Laughter) Shall we recess for the committee hearing.

(The meeting was closed at 11:24 o'clock a.m.)